

Students' Perspectives on Worldwide “Greening” of Tertiary Education Curricula

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Abstract Several scholars have suggested the introduction of an environmental literacy requirement into the curricula of Non-Environmental Science disciplines in tertiary institutions of the world as a “greening” strategy for fostering global environmental stewardship necessary for enhancing understanding and collaboration in tackling the major environmental risks facing our global village today. However, there is no study on students’ opinion on this issue. This study was therefore initiated to 1) evaluate the opinion of undergraduate students on the introduction of a worldwide environmental literacy into the curricula of Non-Environmental science majors as a graduation requirement; and 2) identify any possible demographic differences in opinions among the student subjects polled. We sought the opinion of 800 undergraduates from African, North American and European universities on the subject and 99% responded. The result showed that a majority (67%) of them supported the worldwide environmental literacy requirement and those already trained were significantly ($P < 0.0001$) more likely to support it than those untrained. Students from developing countries were significantly ($P < 0.0001$) more likely to support it than those from developed countries; similarly students in the Arts’ disciplines were more likely to support it than Non-Arts’ students as a group. However, no significant differences were observed between students from Francophone versus Anglophone countries; Social Sciences versus Non-Social Sciences majors and between Education versus Non-Education majors. Some similarities were observed between the opinion of university-age students in this study and 15-year old secondary school students from two major international surveys (Research on Science Education-ROSE, and Program for International Student Assessment-PISA) on science education; further studies comparing these two categories of students is suggested. The need for all professionals to be literate about the science of their surroundings was the most identified reason for supporting the literacy requirement by the students polled. The results of this study thus provide evidence of

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support by students in the on-going paradigm shift towards “greening” the curricula of tertiary institutions and thus reinforces its implementation by leaders of academe and policy makers worldwide.

Keywords Environmental literacy · Environmental education · Students’ opinion · Global education · Environmental stewardship · Education for sustainability · Greening · Undergraduate curricula · Student survey

Introduction

Our global village (Earth) currently faces enormous environmental challenges that threaten our sustainability in the new millennium. These challenges include global warming, biodiversity loss, ocean pollution, ozone depletion, overpopulation and others that transcend national boundaries. Although public awareness about these environmental issues is growing all over the world, mere awareness of the issues does not readily translate to an understanding of the science behind them or the enormity of the risks they pose to humans. Some people are also unaware that the social responsibility of addressing these global issues rest in the hands of everyone—rather than just environmental “experts” (Smyth 2005; Redclift and Benton 1994). That people are unfamiliar with these environmental risks can lead to unnecessary fears since unfamiliarity usually leads to overestimation of health risks (Yassi et al. 2001); it is no surprise therefore that there is an unprecedented level of apprehension about the environmental future of our planet today than ever before (Allen 2007). That this situation demands urgent solutions is an understatement, and obviously requires bold participation of people from all over the world, as no one is immune from these risks arising predominantly from the race between economic development and degradation. It is conceivable therefore that global collaboration in this regard could be facilitated through an educational strategy that enhances global environmental stewardship through a worldwide “greening” of higher education curricula—greening in this regard referring to the integration of environmental/ecological scientific knowledge for sustainability into the curricula of undergraduate studies (except environmental science majors). This view is based on the premise that populating the world with more environmentally-literate graduates who are the future leaders, will in part increase environmental literacy of the public as more people graduate from tertiary institutions. Such knowledge could strengthen the scientific background of graduates of higher institutions and thus provide the necessary attitude and skills for making informed decisions and taking responsive actions, while educating others formally or informally (Environmental Protection Agency 2007). Furthermore, such a move will in part, fulfill the call for a re-orientation of Environmental education towards sustainability suggested by several authors (e.g., Jennings 2008; Stevenson 2007; Smyth 2005; Tilbury 1994; Alabaster and Blair 1996; Hart and Nolan 1999) and contained in Agenda-21 of the Earth Summit in Rio de Janeiro in 1992.

The pivotal role of higher educational institutions in ensuring a sustainable future society has been well documented e.g., the Association of University Teachers (AUT 1999), the Presidential Council on Sustainable Development (PCSD 1994, 1999). Other scholars such as Mahmoud (2006) have called for renewed efforts for harnessing education as a weapon for ensuring environmental sustainability, and Aighewi and Osaigbovo (2006) specifically called for the introduction of an environmental literacy requirement to the curricula of all tertiary institutions as a worldwide strategy for “greening” their curricula and ultimately

fostering environmental stewardship. Recently, some British scholars have begun urging colleagues in universities around the world to take action on climate change in order to 'green' their university campuses and curricula (University College Union 2007). Indeed, few would question the need for individuals, communities, and countries finding better ways to collaborate on learning about and helping to solve critical environmental problems (Dickerson 2004). As our global learning society is coming of age due to the phenomenal communication technology revolution since the 1990s, collaboration at the local, national and international levels has improved tremendously and is paving the way for connecting people of like interests around the world. This is obviously an added advantage in environmental governance that could facilitate global environmental problem-solving if these future leaders share common knowledge and an environmental stewardship worldview. The Association of University Teachers (AUT 1999) once argued that if higher education is to be part of social progress, it must grapple with sustainable development issues; those who are being educated will have to deal with social and environmental legacies left by the current generation, and will in turn create social and environmental legacies for future generations. Based on the scale of environmental risks facing the human family today, some, including Jeffrey Sachs, the notable economist and leader of the Earth Institute in New York, USA, are of the opinion that the world is grossly under-investing in education and that there is the need to boldly invest in long-term issues like the environment in order to ensure the sustainability of the human family (Allen 2007). A recent assessment report on environmental literacy in America (Coyle 2005) showed that even at a time when Americans are faced with increasingly challenging environmental choices, most of her citizenry is by and large both uninformed and misinformed about the environment. A recent study in the U.S (Wolfe 2001) showed that 11.6% of the 496 institutions polled indicated that an "environmental literacy" course was required of all students and 55% reported that such a course was available and countable toward the institutions' general education requirement. Similarly, a survey conducted in the 1990s by the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the United Nations Environmental Programme (UNEP) showed that only about 7% of institutions of higher education in the world offer degrees in the environmental sciences (National Science and Technology Council 1996); although the number of institutions may have increased since then, no recent international surveys on this subject are available to confirm or dispute this low number. The UNESCO has long recognized the vital role played by higher education in shaping the way in which future generations learn to cope with the complexities of sustainable development. It recognizes higher education as the driving force for national development in both developed and developing countries, as it educates highly qualified graduates and responsible citizens able to meet the needs of all sectors of human activity. In addition, it provides opportunities for higher learning and for learning throughout life; it advances, creates and disseminates knowledge through research and provides as part of its service to the community relevant expertise to assist societies in cultural, social and economic development. Furthermore, it helps protect and enhance societal values by training young people in the values which form the basis of democratic citizenship and contributes to the development and improvement of education at all levels, including the training of teachers (UNESCO 2005).

While considering the roles and functions of higher educational institutions for promoting sustainable development however, there is the need to increase the relevance of teaching and research for the societal processes leading to more sustainable patterns and discouraging unsustainable patterns of life, improving the quality and efficiency of teaching and research, bridging the gap between science and education, traditional knowledge and

education, and strengthening interactions with actors outside the university such as local communities and businesses. It should also introduce decentralized and flexible management concepts, offering access to scientific knowledge of good quality, enabling students to obtain the competency needed to work together in multidisciplinary and multi-cultural teams in participatory processes, and bringing the global dimension into individual learning environments (UNESCO 2000, 2004). Without a doubt, the time to revamp and exploit these roles of higher education in general and for environmental stewardship in particular is now. A worldwide literacy requirement for undergraduate studies could at least guarantee graduates the formal environmental knowledge base to tap into for decisions and build upon non-formal sources throughout their lives.

Perhaps a more important and urgent question about the shifting educational paradigm towards environmental literacy and sustainability is: What is the opinion of the student end-users? In fact, all too often, the most important people involved in education are frequently left out of what is ostensibly designed for them (Cook-Sather 2006). Although many students have valuable ideas about what would make their learning more meaningful and engaging, they are often being educated without voice or choice in the process. According to Unger (2003), the best way to engage students in learning is by listening to them. It has also been suggested (Moffit 2003) that when students become partners in creating their own educational plan through expression of their interests and creativity, and in an atmosphere of fun, they become motivated and engage in deeper learning, dramatically reducing off-task behaviors and concerns. As a result, it is definitely time we counted students among those with the authority to participate both in the critique and in the transformation of education because young people have unique perspectives on learning, teaching, and schooling; their insights warrant not only the attention but also the responses of adults and they should be afforded opportunities to actively shape their education. Unlike elementary and secondary schools, only a few researchers have focused on university-level assessment of environmental literacy (Kapowitz and Levine 2005). This study was therefore initiated as a follow-up to our earlier call (Aighewi and Osaigbovo 2006) for the “greening” of higher education curricula with the following objectives: 1) Evaluate the opinion of undergraduate students on the introduction of a worldwide environmental literacy into the curricula of undergraduates (except environmental science majors) as a graduation requirement; and 2) identify any possible demographic differences in opinions amongst the student subjects polled.

Methods

Eight hundred (800) undergraduates from eight tertiary institutions (100 each) in three continents—Africa, North America and Europe, representing developing and developed, English and French-speaking countries were polled using questionnaires administered directly to undergraduate subjects individually. Undergraduates of all majors, regardless of their background knowledge about the environment were polled. The survey instrument used for this study was initially developed and tested as described by Morrone et al. (2001). We used two focus groups of 40 undergraduate students from the Université de Ouagadougou in Burkina Faso, and the University of Maryland Eastern Shore in the United States (two groups of 10 students per school) to test the reliability of the instrument by observing the consistency of the responses to the same questions from the four groups. The data resulting from the groups was translated, coded and analyzed and used to refine the final version (See Table 1 for the questionnaire items). Two open-ended questions were included to establish the basis for the Yes–No questions about the subjects’ opinions and

Table 1 Survey questions

Q1	Have you taken any course(s) in Environmental Sciences since you began your undergraduate studies? 1) Yes 2)No
Q2	How long ago? <i>Currently, 1–5 years ago, 5–10 years ago</i>
Q3	Do you support the introduction of a worldwide Environmental literacy requirement into the curricula of all non-environmental science disciplines in all institutions of higher learning as part of the graduation requirement? 1) Yes 2)No
Q4	Which of the following explains why you are in support of the Environmental Literacy Requirement? 1) <i>All professionals need to be knowledgeable about the science of their surroundings or environment</i> 2) <i>Knowledge of Environmental Science will provide the vocabulary and sensitivity needed by all professionals for addressing environmental problems at all levels</i> 3) <i>Environmental literacy of professionals worldwide will promote unity and collaboration in addressing global environmental issues of our times.</i> 4) <i>Others (Please specify)</i>
Q5	Which of the following explains why you are not in support of the Environmental literacy Requirement? 1) <i>It is an additional academic burden on undergraduates.</i> 2) <i>Environmental problems should be addressed by Environmental Scientists only</i> 3) <i>I took Environmental Science course(s) in Secondary/High School so I don't need it anymore.</i> 4) <i>Others (Please Specify)</i>

three common responses to the questions were selected from the two focus groups and a fourth option (“others, Please Specify”) added as options and incorporated in the final questionnaire administered later. Two versions (English and French) of the same questionnaire were prepared; the English version was administered to undergraduate students in Nigeria and the United States while the French version was administered to students in France and Burkina Faso. The first part of the questionnaire contained basic information about their university, gender and discipline of study, including a brief definition of Environmental Science and Environmental Literacy to guide subjects who may not be familiar with the terms based on feedback from the focus groups. Environmental Science was defined simply as: “*The branch of science that involves the systematic study of our natural environment (surroundings) with respect to the interaction among the physical, chemical and biological components.*” Environmental Literacy Requirement was also defined simply as “*Knowledge about the science of the environment acquired to fulfill part of a student's graduation requirement*”. The North American universities polled included the University of Maryland Eastern Shore in Princess Anne, Maryland and Salisbury University in Salisbury, Maryland; while those from Africa included the University of Benin in Benin City, Nigeria, and Benson Idahosa University in Benin City, Nigeria; Université de Ouagadougou, and Institut Supérieur d'Informatique et de Gestion in Ouagadougou, Burkina Faso. The European universities included: Université Pothier-Paris II and Université Paris 7 Denis Diderot in Paris, France. These universities were selected based on geographical spread and general economic status of the host countries, i.e., developed versus developing. In all cases, the questionnaires were

administered to students in libraries and student centers after initially establishing their academic status as undergraduates. Subsequently, data obtained for each study site were collated, coded, and analyzed statistically with SPSS software using percentages and Chi-Square (χ^2) test of independence (Preacher 2001). All subjects polled were documented as belonging to the respective institutions and countries where the surveys were conducted without regard to their true country of origin.

Results

Study Sample General information about the eight tertiary institutions and students polled is shown in Table 2. These institutions ranged from public to private, small to large student population, French and English-speaking from developing to developed nations. While the undergraduates polled represented all disciplines, the majority were from the Social Sciences and Mathematics/Science disciplines; others were from the Arts, Engineering and Education disciplines (see Fig. 1). The students polled in this study were from universities in three of the world's six continents and thus reflect a diverse segment of undergraduates worldwide; this is particularly the case for the United States and France that are among the six leading host nations of international students worldwide (American Council on Education 2006). Slightly more than half of these students have had or were currently receiving some training in Environmental Science and both genders were well represented. The male students polled ranged from a low proportion of 42% in Institut Supérieur d'Informatique et de Gestion (AFBFIS) in Burkina Faso to a high of 68% in Université Patheon-Assan Paris II (EUFRED) in Paris. Of the 800 questionnaires administered, 795 or 99% were filled correctly and completely by the students and thus five were excluded from the analysis.

Students' Opinion The result of this study showed that of the undergraduate students polled in all countries and universities from all continents studied, a significant ($p < 0.01$) majority (67%) of them supported the introduction of an environmental literacy requirement into tertiary institution's curricula for non-environmental science disciplines worldwide, while 33% did not. However, a Chi-square (χ^2) analysis (Table 3) showed that there was a

Table 2 List of tertiary Institutions where students were polled

Tertiary institutions/code	Location	Type	Population
University of Benin (AFNIBI)	Benin City, Nigeria, Africa	English, Public	40,000
Benson Idahosa University (AFNIUB)	Benin City, Nigeria, Africa	English, Private	4,320
Université de Ouagadougou (AFBFUO)	Ouagadougou, Burkina Faso, Africa	French, Public	4,595
Institut Supérieur d'Informatique et de Gestion (AFBFIS)	Ouagadougou, Burkina Faso, Africa	French, Private	5,422
University of Maryland Eastern Shore (NAUSUM)	Princess Anne, USA, N. America	English, Public	4,000
Salisbury University (NAUSSU)	Salisbury, USA, N. America	English, Public	5,000
Université Patheon-Assan Paris II (EUFRED)	Paris, France, Europe.	French, Public	18,000
Université Paris 7 Denis Diderot (EUFRED)	Paris, France, Europe.	French, Public	27,000

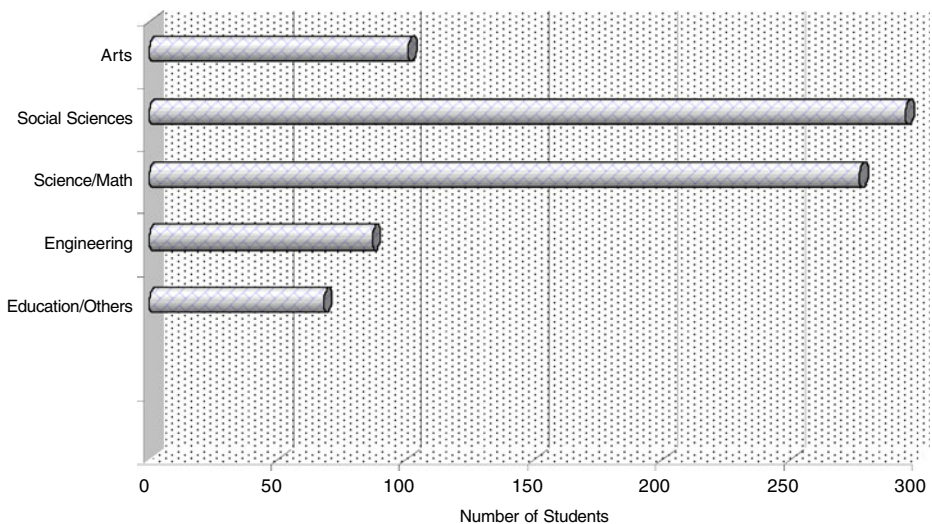


Fig. 1 Academic majors of students subjects

significant ($p < 0.0001$) difference between the support by students in the developing (Nigeria and Burkina Faso) and developed (United State and France) countries. Students were far more likely to support the requirement in developing countries than their developed counterparts. Students who have received or were receiving any form of environmental science training were also significantly ($p < 0.0001$) more likely to support the literacy requirement compared to those who have not (Table 3). However, our analysis did not show any significant difference between the level of support by students from Francophone (Burkina Faso and France) and Anglophone (Nigeria and U.S) countries. Further chi-square analysis of the students' opinions was done based on the academic disciplines declared (Table 4). This analysis did not show significant differences in the opinions of students in the Social Science disciplines compared to the other students from Non-Social Science disciplines as a group; and between students in Education versus all

Table 3 Contingency tables (2×2) of student's opinions

	Support	No support
<i>a. Students from developed versus developing countries</i>		
Developed countries	214	186
Developing countries	338	57
$\chi^2 = 94.804; p < 0.0001; N = 795$		
<i>b. Trained versus untrained students in environmental science</i>		
Trained	295	88
Untrained	257	155
$\chi^2 = 19.374; p < 0.0001; N = 795$		
<i>c. Students from Francophone versus Anglophone countries</i>		
Francophone	265	130
Anglophone	294	106
$\chi^2 = 3.613; p < 0.06; N = 795$		

Table 4 Contingency tables (2×2) of student's opinions by disciplines

Outcome	Support	No support
<i>a. Students from education versus all others/non-education disciplines</i>		
Arts	58	10
Non-arts	466	254
$\chi^2=0.022$; $p<0.8811$; $N=795$		
<i>b. Students from arts versus all others/non-arts disciplines</i>		
Arts	21	10
Non-arts	509	257
$\chi^2=10897$; $p<0.001$; $N=795$		
<i>c. Students from social sciences versus all others/non-social sciences disciplines</i>		
Social sciences	265	125
Non-social sciences	265	140
$\chi^2=0.459$; $p<0.4983$; $N=795$		

other students in Non-Education disciplines as a group. However, there was a significant ($p<0.001$) difference between the support by students from the Arts' disciplines compared to students in Non-Arts' disciplines as a group. Students pursuing Arts disciplines or majors were more likely to support the introduction of Environmental literacy requirement in their curricula than those in Non-Arts disciplines (i.e., Mathematics, Science, Engineering, Education and Social Sciences).

When students who supported the introduction of an environmental literacy requirement were asked about the basis of their support, a majority of them chose the option that there is the need for professionals to be knowledgeable about the science of their surroundings or environment. Other less identified reasons included: developing the vocabulary and sensitivity needed by professionals for addressing environmental problems or that environmental literacy will promote unity and the collaboration needed for addressing environmental problems.

The majority (57%) of the students who disagreed with the introduction of environmental literacy were of the opinion that environmental problems should be addressed by Environmental Scientists and that an environmental literacy requirement will constitute an additional academic burden on them; others claimed to have received environmental science training in their respective secondary/high schools and so did not need it.

Discussion

Although environmental literacy can be acquired formally and informally, and have continued to undergo modifications due to shifting emphasis (Smyth 2005; Hart and Nolan 1999), this study focused specifically on students' opinion about environmental knowledge acquisition through formal academic curricula as part of the graduation requirement in tertiary institutions of the world. This type of literacy can be acquired either as a separate general education requirement or intentionally integrated into various courses in their program. It is worth emphasizing that environmental literacy in this context is not merely

the overall awareness of simple environmental issues but that which is backed by well established goals and curricula as has long been suggested by Hungerford et al. (1980).

The greater support of environmental literacy by students from developing countries than their counterparts in developed countries is rather significant. In fact, only 37% of the student subjects from Nigeria and Burkina Faso have had or were currently receiving any form of Environmental Science training compared to 49% of their counterparts from the United States and France. Interestingly however, our result is somewhat similar to that reported by Sjoberg and Schreiner (2005) for students at the secondary school level. In their international comparative study involving 15-year old students from 40 countries in different continents, they observed that the higher the level of development in a country, the lower the interest students expressed in learning about science and technology-related topics. It is also arguable that the differences observed may be attributable to differences in biophilia between students from developing versus developed countries. This assertion is supported by Noss (2004) who posited that (although genetics may be involved) children are attracted to natural objects—animals plants etc while young, but lose touch with nature more readily as they grow older—since they become conditioned to valuing television, computers and video games above nature and conservation efforts. Because communication technologies such as televisions, computers, and video games are not generally as readily affordable and accessible in developing countries (Davidson et al. 2001), the argument can be made that young adults from developing countries may be generally more biophilic and thus more willing to support environmental literacy and conservation efforts than their counterparts in developed countries (U.S and France in this case). The fact that students polled in both international comparative studies tended to exhibit a relatively similar attitude based on economic status—despite differences in their educational level and age deserves further investigation. Furthermore, it is arguable that the difference in opinions observed could be due to the greater access to non-formal environmental education via print and electronic media amongst students in the developed than developing countries. Such a situation may give the former a greater sense of familiarity with the environmental issues (rather than the science behind the issues) and perceptively less need for a formalized environmental literacy requirement, unlike their counterparts in developing countries with less access. Although formal education in schools is important and often sets standards by which education is defined and judged, people also learn how to behave towards the environment in their homes, from relatives, peer groups, cultural influences, the mass media, advertising, and public examples set by those in authority (Smyth 2005).

The significantly higher support for environmental literacy by students who have received or were receiving environmental science training compared to those who have not may suggest that as students acquire knowledge of Environmental Science, they tend to have a greater appreciation for environmental literacy and the essence of “greening” of academic curricula in general. This view is supported by the work of Wolfe (2001) who reported that taking as little as one course in environmental literacy does produce more environmentally-responsive behavior. Similarly, Coyle (2005) concluded that a higher level of environmental knowledge correlates significantly with a higher degree of pro-environmental behavior. In their study, 10% of the environmentally knowledgeable people polled were more likely to save energy in their homes; 50% more likely to recycle, 10% more likely to purchase environmentally safe products and 50% more likely to avoid using chemicals in yard care. Furthermore, quantitative studies of environmental knowledge, attitudes and behavior (Hart and Nolan 1999) concluded that there is generally a change towards more positive environmental attitudes among people of all ages after exposure to some form, almost any form of environment-related or even in-class environmental

education experience—whether short or long term. Another recent study (O'Brien 2007) also showed a correlation between environmental knowledge and attitudes of some Iowa University students in the United States of America. Although schools are still seen as instruments for changing behaviors towards those that experts have determined as desirable (Stevenson 2007), the point must also be made however, that some studies have reported no positive relationship between environmental awareness and knowledge and pro-environmental behavior (Kollmuss and Agyeman 2002; Yount and Horton 1992; Hicks 1993).

Unlike students in Education, those in the Arts' disciplines polled in this study were more likely to support the introduction of a worldwide environmental literacy requirement than Non-Arts' students as a group. Although it is known that different disciplines attract students of a particular attitudinal orientation (Hodgkinson and Innes 2001), this result may not be unrelated to differences in personality types of the students polled in this study. Of the seven known personality types, those with artistic personality prefer the arts and eschew conformity with rules; they also see themselves as sensitive and open, while others may see them as creative even if disorderly (Smart et al. 2000). Experts generally agree that to change an individual's behavior, knowledge about the environment must be associated with sensitivity, personal beliefs, decision-making and problem-solving skills (Morrone et al. 2001); consequently, the sensitivity of the Art students polled in this study may well have played a key factor in their opinion compared to the Non-Art students as a group. While this result certainly deserves further research, the world of art has always been known to play a critical role in provoking thought and generating dialog; for example, the United Nations Environmental Programme is increasingly using Art as a catalyst for promoting environmental causes as evidenced by the "Art for the Environment" initiative (UNEP 2008) created recently to stimulate interest and focus individuals, communities and leaders on environmental values.

Students in this study who did not support the environmental literacy requirement were of the opinion that environmental problems should be addressed by Environmental Scientists only. A recent survey of some secondary school students from England (Jenkins and Pell 2006), showed a similar opinion. Students polled in their study were also of the opinion that environmental problems should be left to environmental experts to address. The implication of this is that they are unaware of the magnitude or scope of the problems and the power of individual choices and decisions in addressing these problems for the sake of sustaining our existence in this global village of ours. In fact, global environmental problems have reached the stage where their solution cannot be left to the "environmental experts" alone (Redclift and Benton 1994). Environmental Education increases public awareness and knowledge about environmental issues or problems and thus provides the public with the necessary skills to make informed decisions and take responsive actions (U.S. Environmental Protection Agency 2007). The students who did not support the literacy requirement in this study may well lack the interest needed—probably because they did not appreciate the relevance of the environment while in their secondary school days and still do not. The lack of relevance of science and technology curriculum has been identified as one of the greatest barriers for good learning as well as for stimulating interest in the subject (Sjoberg and Schreiner 2005) and environmental literacy is no exemption. Recently, an international comparative project aimed at shedding light on the factors of importance to the learning of science and technology by 15-year old students from more than 40 nations (ROSE 2008) commenced in Oslo, Norway; the outcome of this on-going study could provide the basis for informed discussions on how best to improve curricula and enhance interest in science and technology in a way that respects cultural diversity and

gender equity, promotes personal and social relevance, and empowers the learner for democratic participation and citizenship. Although our current study focused on tertiary institutions, the data generated from this global survey will also guide future discussions on the attitude of students at the tertiary education levels and beyond on the subject of “greening” curricula for sustainability.

The fact that most students who supported the worldwide introduction of environmental literacy in this study did so because of the need for professionals to be knowledgeable about the science of their surroundings is equally significant because it indicates their recognition of the importance of environmental literacy in their lives. Coincidentally, 15-year old students polled recently in the Program for International Students Assessment study (PISA 2006) expressed a somewhat similar view. In their study involving students from 57 countries, 75% of the respondents recognized that science is important for understanding nature and improving living conditions as well.

Conclusion and Implications

We have shown through this research that the majority of the undergraduate subjects polled from across three continents support the introduction of an environmental literacy requirement to the curricula of tertiary institutions all over the world because of the need for all professionals to have knowledge of the science of their surroundings or environment. However, differences in opinion between students from developing and developed countries exist as has been shown for students at the secondary level drawn from several developing countries. Although three plausible arguments have been advanced to explain the basis for the disparity in opinion, further investigations would be needed, particularly in relation to the outcome of the on-going comparative study on science education (ROSE) and (PISA). Of particular significance in this regard is whether or not the results of our study reveals the attitude of the undergraduate subjects now or simply reflects the attitude brought forward from their secondary school days. This is particularly relevant since it has been argued (Tilbury 1994) that children must develop a sense of respect for and caring for the natural environment during their first few years of life or be at risk of never developing these values. Notwithstanding this qualification, however, this study provides support for the on-going paradigm shift towards 'greening' the curricula of tertiary institutions as well as the Talloires Declaration of the Association of University Leaders for a Sustainable Future (AULSF 1990). Furthermore, it reinforces the implementation of a 'green' curricula by these leaders of academe, policy makers and others yet to embrace this strategic approach to ensuring the sustainability of our global village in the new millennium and beyond.

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