

Students' Views about the Inclusion of Environmental Education and Education for Sustainability in Teacher Education Courses

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ABSTRACT Education can solve many of the burning environmental issues in the world. Universities should play an important role also. This paper will focus on the role teachers, education faculties, colleges and institutions can play in implementing environmental education and education for sustainability. It is argued that provision should be made for environmental education and education for sustainability in curricula for teacher training and those student teachers should be taught how to teach environmental education and education for sustainability in an interdisciplinary way. The skills and knowledge student teachers gain should be assessed during teaching practice visits by lecturers.

INTRODUCTION

For the past few decades, there has been a growing concern both at the global level as well as at the national level about achieving sustainable development and dealing with everyday environmental problems (Asghar 2009). Today, we find a continuous depletion of natural resources, deforestation, an extinction of many plant and animal species, a rise in global temperature, environmental pollution, a shrinking of the important lifesaving ozone layer, etc. (Barnatt 2012). The situation has become quite grave with population explosion, food crises, hunger, malnutrition, poverty, insanitation and excessive consumerism which have all placed serious strains on the essential life-support systems of our planet.

Threats to the peace and security of nations from environmental breakdown are today greater than any other foreseeable military threat from conventional arms (Rao 1999; Gupta 2009) and these are gaining a frightening pace. Local and regional conflicts, based on environmental disruption, the scarcity of water and other natural resources and energy consumption, have already assumed alarming proportions worldwide. These environmental threats now staring us in the face could have so much momentum that, unless concrete steps are taken to reverse them, they may soon overwhelm our ability to respond to them (Baliga 1996), even threatening all living beings including man himself with disaster or

even extinction (Khan 2013). The recent Tsunami disaster, brought on by the relentless destruction of mangroves and coral reefs, bears testimony to this (Shiva 2005). The environment and natural resources directly affect the standard of living or quality of life of the people. The welfare of the individuals ultimately depend upon a viable life supporting system (Das 1980), which can be provided only by a clean and vibrant ecosystem.

Education in general and teacher education in particular, have a special role to play in environmental education (EE) and education for sustainable development (ESD). Teachers' knowledge and understanding of environmental and developmental issues and their level of commitment, attitude and devotion would determine the future of the society and its development. The World Commission on Environment and Development (WCED 1987), in its report "Our Common Future", defines Sustainable Development, as the "development which meets the needs of the present generation without compromising the ability of the future generations to meet their own needs".

The objectives of Sustainable Development (SD) are to ensure the well-being of the present and the future generations and to maintain a healthy environment and life-support system. The sustainable development framework entails thinking far into the future and taking into account how our present actions might affect our ability to live a wholesome and fulfilling life. One

can look at Sustainable Development on a global, regional, national, state, local and even individual scale. The World Watch Institute (WWI) in its annual publication 'State of the World', 2006, especially focuses on the dramatic rise of the two Asian powerhouses, namely: India and China, with about 40% of the world population and says that "the choice of development they make in the next few years would lead the world either towards a future - a path of development or of acceleration towards a collision course with the world's ecosystems and resources".

Sustainable development does not imply absolute limits on economic growth (CEE 1994), but takes into account the limitations imposed by the availability of resources, the present state of technology, the ability of the biosphere to absorb the effects of human activities, as well as social values. It is said (Schuyler 1983), that, "We have reached a stage when we must shape our actions throughout the world with a more prudent care for our environment. Through ignorance or indifference we can do massive and irreversible damage to our environment."

Education in its traditional form is not sufficient to meet the immense challenges posed by the phenomenon of unsustainable living. People are becoming increasingly aware of the dangers they face and of the need for an informed action. New educational approaches are required to achieve necessary changes in lifestyles, to be successful in combating waste in developing a new ecological vision and in fostering a sense of global solidarity (Mayor 1997). Herculean efforts are needed to educate people and to solve environmental problems.

Environmentalists have taken up environmental protection aspects in a serious way. They have taken a very strong position after the United Nations Conference on Human Environment at Stockholm in 1972, which was a major event for those concerned with the quality of world's environment. One of the major recommendations of the Conference resulted in the creation of United Nations Environmental Programme (UNEP), while other recommendations specially constituted the foundation of framework for cooperative efforts on International level.

Environmental education (EE) is a way of implementing the goals of environmental protection. EE is not a separate branch of science or subject of study. It should be carried out according to the principle of life-long integrated education.

In many countries Ministries of Education interact actively with universities, NGOs and other role players to introduce and expand environmental concepts, themes, issues, etc. in the curricula of schools and universities. The present problem can be tackled best if a proper awareness and attitude towards the environment is developed both among individuals and the society. A systematic, organised and awakened social mind can be developed only through the right type of education and it is through the right type of education that appropriate awareness can be created to make life and its environment creative, constructive and progressive. To develop such a state of mind, fostering a scientific attitude among individuals for the growth and the development of environmental awareness is essential.

Importance of Environmental Education and Education for Sustainability in Teacher Training Programmes

Although we have studied the environment for a great period of time, it is only over the past few decades that scientists and educationists have started to take a keen interest and pay attention to Environmental Education (EE) and Education for Sustainable Development (ESD). Over millions of years, all forms of life in our biosphere have undergone evolutionary changes, consistent with the changing environment (Cracraft 2005). The environmental changes caused by the unchecked growth of industries in the west and by the unchecked growth of human population in the east have already reached such proportions that it can be literally seen, tasted and smelled. We are also realising that the air, water and land are becoming more polluted due to technological advancement (Das Sharma 2009).

Education has a major role in implementing environmental protection and conservation (California EEI 2012). Nature conservation and environmental protection are extremely important for the primary health care of the individual. EE and ESD programmes should be introduced at every level of schooling. Neither people nor their surroundings can be treated separately for educational purposes. There must be a coordinated and comprehensive approach to EE and ESD as a whole. One cannot ignore the position of teacher and teacher training programmes in environ-

mental perspectives, when we talk about EE and ESD. If we want to implement programmes for EE and ESD successfully in secondary schools, it is essential that a teacher must be trained with all the required skills, attitudes and values essential in teaching environmental concepts. Therefore, the introduction of EE and ESD in Teacher Education Faculties and Universities should be treated with due importance.

Education for Sustainable Development and Environmental Education: Towards Developing a Curriculum

Any approach to education could include social reconstruction which offers solutions to the problems a society is faced with (Sathe 1997). These problems could be economic, social, cultural, ecological and educational. As teachers are the torch bearers in creating social cohesion, national integration and a lean ring society, the quality of education is a direct consequence and outcome of the quality of teachers and the teacher education system. IUCN (1980) observes that three objectives that are paramount to the future well-being of the species and the planet are needed to be taught to the teachers. These are:

- a) Maintaining ecological process and life support system;
- b) Preserving genetic diversity; and
- c) Ensuring sustainable utilisation of species and ecosystems.

To realise this, the curriculum of teacher education institutions needs to provide the basic knowledge and conceptual understanding of EE and ESD in order to develop relevant skills and attitudes in student teachers and the existing cadre of teachers. This calls for proper development of skills for competency based teaching, continuous and comprehensive evaluation, organising and conducting projects and activities related to local specific conditions and the daily life learners.

To design a curriculum which addresses the needs of environmental protection and ESD it is necessary to address a number of issues. In this paper the following was addressed:

- Where does EE or ESD fit into teaching programmes?
- How can EE or ESD be strengthened through teaching practice?

- Do education students know the concepts EE and ESD?
- Did students encounter EE/ESD in post graduate training before they entered professional teacher training courses?
- Will students voluntarily take EE/ESD as a subject?
- Should EE/ESD be an independent subject in a qualification?
- Should EE/ESD be presented as part of subject didactics/methods modules?
- In which education discipline does EE/ESD belong?
- How should EE and/or ESD be presented in classrooms?
- How much time should be spent on EE/ESD in the school curriculum?

METHODOLOGY

A questionnaire was distributed to Post Graduate in Education (PGCE) students at the two largest universities in South Africa (University of Pretoria and University of South Africa). To ensure full participation, the questionnaires were distributed during contact sessions with the students. Two hundred and six (206) from Pretoria University and one hundred and fifteen (115) students from the University of South Africa participated in the survey. This meant that a total of 321 students participated in the survey. Results were reflected in tables and analysed.

RESULTS

Students' Knowledge about EE and ESD

For teachers, Putnam and Borko (2000: 22) present the argument that:

The individual teachers... bring with them different areas of expertise; some are extremely knowledgeable about the subject matter... [others] bring different pedagogical understandings and expertise to the group discussions. By drawing on each individual's private understandings, which represent these different degrees of pedagogical and disciplinary expertise, the collective understanding of the group is thus advanced.

Again, these perceived benefits apply particularly in the case of ESD, which, as outlined above, draws upon concepts and pedagogical expertise located in more than one discipline.

However, interdisciplinary initiatives do not have a good record of success whether in this country or abroad. In the specific case of ESD, Cross (1998: 6) points to:

... these efforts have not led to an integrated holistic conception of sustainability capable of incorporating in one sole vision all of the social relations, the human-nature and all of the axiological and ideological supra structure that supports such a vision.

The question, however, is whether students know enough about ESD or EE before they enter their professional training. Students were asked about their knowledge of these two disciplines.

Table 1: Views of students about the meaning of the concepts EE/ESD

University	N	Percentage (%)
University of Pretoria	90 out of 206	43.7
University of South Africa	48 out of 115	41.7
Total	138 out of 321	43.0

From Table 1 it is clear that less than half of the students at both universities indicated that they knew the meaning of the concepts of EE and ESD. This situation could even be worse for South Africa as a whole since other universities are smaller and all do not offer EE or ESD.

Previous Training in EE/ESD in Undergraduate Courses

As above-mentioned one would accept that students bring their own knowledge about EE and ESD into a professional teacher training course, but they also may have received official training in their under-graduate courses. Students were therefore asked whether they encountered EE/ESD in their graduate training before they entered their professional teacher training course.

From Table 2 it is clear that in total 64.8% of students indicated that their pre-graduate training made provision for environmental education although only 43.0% indicated that they knew the concept (see Table 1). This could indicate that students' graduate training did make provision for knowledge about EE and ESD, but that

they did not gain sufficient knowledge to know what the concepts meant.

Table 2: Number of students that indicated that they encountered information about EE or ESD before they entered their professional training courses

University	N	Percentage (%)
University of Pretoria	127	61.7
University of South Africa	81	70.4
Total	208	64.8

Turning to pedagogy, ESD and EE challenges teachers to provide opportunities for pupil learning which encompass knowledge, values and skills. The literature on ESD and EE pedagogy advocates active learning, critical evaluation of values and cultural sensitivity (for example, Edman 2004).

Jickling (1992) argues that 'we must enable students to debate, evaluate, and judge for themselves the relative merits of contesting positions'. In a similar vein, Björneloo (2004) suggests that 'central concepts in ESD and EE are independence, critical thinking, participation and evaluation of results'. Several authors emphasise the importance of relating global issues to local realities and action at a local level (for example, Edman 2004) indeed, Hopkins et al. (1996) identify this as a first step in the pedagogy of ESD. A key feature of such issues (global or local) is that they are almost always controversial, since people view their causes, impacts and management differently according to their own perspectives and values. Teaching about controversial issues raises important questions for teachers concerning bias, balance and personal beliefs (for example, Stradling et al. 1984; Halstead and Taylor 1996).

The Place of EE in University Teacher Training Curricula

Literature, as stated above, reveals that EE and ESD should be interdisciplinary approaches in any form of education, but how do students feel about this? Students were asked about their views of taking it as an optional module in a professional teacher education course.

It is clear from Table 3 that quite a large percentage of students indicated that they will take EE or ESD as an optional choice in their professional development course.

Table 3: Students' views about taking ESD EE/ESD as an optional module in their professional teacher training course

University	N	Percentage (%)
University of Pretoria	137 out of 206	66.5
University of South Africa	93 out of 115	80.9
Total	230 out 321	71.7

Again students were asked whether EE and/or ESD should be presented as a separate subject during a teacher training course.

Table 4: Students' view about whether EE should be presented as a separate subject during teacher training course

University	N	Percentage (%)
University of Pretoria	132 out of 205	64.1
University of South Africa	93 out of 115	80.9
Total	225 out of 321	70.1

Again the majority of students at both universities indicated that EE and ESD could be presented as separate subjects (Table 4). This contests findings of the literature as indicated previously that EE and ESD should be interdisciplinary approaches to education. At this point in time we should probably reconsider the term interdisciplinary. Lefebvre's (1996) approach allows us to develop an interdisciplinary approach to teaching EE and ESD but in order for this to happen, it is first necessary to answer the following question: What precisely is meant by an interdisciplinary approach? This ambiguity appears immediately in the multitude of synonyms for interdisciplinarity. For example, the words pluridisciplinarity, multidisciplinary and transdisciplinarity are used in similar ways. However, they all have different senses.

Pluridisciplinarity often is only a juxtaposition of various disciplines. Transdisciplinarity is more ambitious, in that it proposes a conceptual unification between disciplines. Interdisciplinarity, however, assumes a mutual sharing of knowledge between disciplines and is based essentially on a systemic approach. In this way, interdisciplinary teaching is understood as teaching in which two or more disciplines participate in an interdependent process.

Any field of study lends support to the concept of an interdisciplinary approach, insofar as a scientific fact is always an abstraction from a larger complex, and also insofar as that abstraction necessarily marks out a circumscribed area corresponding to a particular inquiry, specific in its approach, its method, and its epistemological presumptions. In fact, all disciplines need allied subjects: physics needs mathematics, biology needs physics and chemistry, while mathematics is most frequently used as an abstract instrument of calculation or logic by other disciplines. Similarly, all disciplines need a mutually accepted language as an auxiliary instrument.

This approach is particularly valuable in dealing with environmental problems, where a phenomenon must be studied through different but complementary approaches. This is the case, for instance, with urbanism, "in which converge such different disciplines as sociology, demography, psychology, architecture, applied physics, and aesthetics." This is a technique which is equally useful in studying pollution, an issue which involves not only biology, physics and chemistry, but also economics, sociology and politics (Leite and Machado 2009).

It will be interesting to know from students of which the majority would take EE or ESD as separate subjects in their course to which educational discipline they think it belongs.

It is interesting from the statistics in Table 5 that the majority of the students chose the relat-

Table 5: Students' view about in which educational discipline EE/ESD belong

Discipline	University of Pretoria		University of South Africa	
	N	%	N	%
Didactics	58 out of 206	28.1	48 out of 115	41.7
Empirical education	95 out of 206	46.1	51 out of 115	44.3
Fundamental pedagogics	28 out of 206	13.6	42 out of 115	36.5
History of education	60 out of 206	29.1	18 out of 115	15.7
Ortho pedagogics	73 out of 206	35.4	14 out of 115	12.2
Comparative education	60 out of 206	29.1	38 out of 115	33.0

ed disciplines of empirical education and orthopedagogics as the disciplines EE and ESD belong to. This might be because of the focus on attitudes that is sometimes advocated for these disciplines (Empirical education includes Psychology of Education and Orthopedagogics includes Remedial education). However, a substantial number of students also indicated didactics as the discipline EE and ESD belongs to. This might reflect an opinion that the ways of teaching and learning the disciplines should be stressed.

Although literature shows that EE and ESD are interdisciplinary approaches it might be more comfortable to present it in certain subject areas. Students were therefore asked to indicate whether they felt EE and ESD should be presented as a part of a subject didactics where a focus is placed on specific subject disciplines.

Table 6: Students' view about whether EE/ESD should be presented as part of a subject didactics method course

University	N	Percentage (%)
University of Pretoria	100 out of 206	48.5
University of South Africa	51 out of 115	44.3
Total	151 out of 321	47.0

In Table 6 it is clear that a majority of students will not agree that EE and ESD should be part of the teaching of a subject didactics. There

is significant evidence to suggest that teachers of science and of humanities subjects differ considerably in the experience and expertise they bring to such issues. Currently, the majority of science teachers consider it their role to present the 'facts' of their subject and not deal with associated social or ethical issues (Levinson and Turner 2002). It will, therefore, be difficult to allocate EE and ESD to a subject.

EE/ESD in the School Curriculum

A discussion was held in the previous part of this paper on the place of EE and ESD in university curricula. It should, however, also be clear how EE or ESD will be presented in the school curriculum because it should influence the development of university curricula.

From Table 7 it is clear that the majority of students felt EE/ESD should be presented once a week during a lesson period!

It is also clear from Table 8 that students are of the view that EE and ESD belong in themes of subjects and not in specific subjects or at certain occasions.

DISCUSSION

From the information collected from students and some literature review it is clear that there are two issues emerging from the data:

1. How EE and ESD should be presented in University curricula.
2. How EE and ESD should be presented in the school curriculum.

Table 7: Students' view about how much time should be spent on environmental education in the school year

Possible time during the year	UP		UNISA		Total	
	N	%	N	%	N	%
One lesson per year (for instance in a life orientation class)	12	5.8	2	1.7	14	4.4
One lesson per week	55	26.7	15	13.0	70	21.8
One whole week (attending an environmental education centre course for example)	43	20.9	11	9.6	54	16.8
One quarter per year by including it all school subjects at a school	24	11.6	2	11.7	26	8.1

Table 8: Students view about how EE/ESD should be presented in the class room

Presentation method	UP		UNISA		Total	
	N	%	N	%	N	%
During themes of specific subjects	30	49.2	20	60.6	50	53.2
Optional section in a specific subject/module	16	26.2	12	36.4	28	29.8
Sporadic once-off sessions (once in the primary school and once in the secondary school)	15	24.6	1	3.0	16	17.0

These two issues have a bearing on each other and should be taken into consideration by curriculum developers. Very little attention has been paid to adult education for EE and ESD (Haugen 2009). This seems true for universities as well. Most initial efforts at universities have gone towards developing curricula for subjects in natural sciences qualifications and later for some social science subjects as well (Emmelin 1976), but little has been done for teacher training courses. A few establishments, though, have been active including EE and ESD in their courses (such as the University of Wisconsin in the USA (Sanera 1997)), but definitely too few have embarked on this journey. South Africa has been an exception and quite a few universities have been providing EE and ESD in their curricula (Irwin 2005). Most of these universities will reiterate that EE and ESD should be interdisciplinary approaches in courses.

The reality is, however, that very few universities have had success in including EE and ESD as interdisciplinary approaches in teacher education courses. The reality is that not all lecturers at universities are capable of including EE and ESD in their courses (being specialists in their subjects and disciplines) and not enough attention can be paid to EE and ESD. Most universities that provide EE and/or ESD teach it as a separate subject as suggested by students participating in the research reported in this paper (Table 3 and 4). However, they do not believe in EE and ESD being taught as part of certain subjects or disciplines (Table 6).

Students, however, believe that EE and ESD should be taught as interdisciplinary subjects at school level (Tables 7 and 8). This concurs with the findings in the literature studied for this paper and reiterated during the paper. The bearing this has on teaching practise is that universities will have to ensure that teachers are appropriately trained to be able to teach EE and ESD in an interdisciplinary way.

A further finding of this research was that student teachers do not have enough knowledge about EE and ESD and should be taught about this during their teacher training courses (Tables 1 and 2).

CONCLUSION

EE and ESD have become more and more important because of the threat to the environ-

ment of which all humans are dependent. It is important that EE and ESD are established well in ALL education but specifically in teacher education. Universities involved in teacher education will have to consider the inclusion of EE and ESD in their curricula. This paper has suggested that it is included in separate self-containing subjects in university curricula and that students' knowledge and skills to present environmental education content during lessons are officially evaluated.

RECOMMENDATIONS

It is necessary that lecturers will assess during teaching practice evaluations (evaluation of student lessons) that students include EE and ESD in their lesson plans and that is done according to the principles set out in modules/courses/subjects provided in teacher education courses.

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