

INSTILLING ENVIRONMENTAL AWARENESS IN UNDERGRADUATE UNIVERSITY STUDENTS

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Summary

Undergraduate students need to be aware of environmental issues and problems for two reasons: First, on graduation they will take up their places in society as teachers, lawyers, scientists, decision-makers, researchers, and so on; and, depending on the nature of their work, their professional activities will have direct or indirect environmental consequences. And second, as stakeholders in the global environment, it is important that they, like everyone else in society, discharge their continuing responsibility by ensuring that their individual behavior and attitude to nature and the environment is conducive to the realization of environmental protection and sustainable development.

However, being merely aware of environmental issues and problems is not sufficient, because in order for awareness to be meaningful in practice, it must positively influence people's behavior and attitude, at both personal and professional levels, as well as action. For it is only then that meaningful progress towards global environmental protection and sustainable development can be made. It is also important for students to understand that as human faculties, intellect and imagination are limited, so too are our science and technology.

If we do not acknowledge this, we can be deluded into conferring upon ourselves, knowingly or unknowingly, some attributes of omnipotence which we certainly do not

possess or have any claim to as mere mortals.

Against this background, the *what* and *how* of instilling environmental awareness in university undergraduates (or equivalent) are proposed and discussed in this contribution.

1. Introduction

Ever since the Rio Earth Summit of 1992 when sustainable development rose to the top of the political agenda, there has been a growing realization of the need for greater environmental awareness at all levels of society. Indeed, chapter 31 of Agenda 21 refers to the development and implementation of “codes of practice leading to greater environmental awareness and contributing to sustainable development” (Hens, 1996).

The implicit assumption is that, as people everywhere become more aware of the natural environment (The “natural” environment comprises air, water, land, biodiversity, etc., as against “man-made” environment comprising buildings, roads, bridges, dams, etc.), its fragility, and of how human activities for economic development have been degrading it relentlessly, they would behave with a more respectful attitude to nature and her life-sustaining benediction which, combined with prudent husbandry of natural resources, will ensure an equitable allocation of those resources between present and future generations and, at the same time, protect the integrity of the natural environment for posterity. Although this assumption makes much sense in theory, in practice it is proving to be little more than an aspiration, however, as continuing and relentless degradation of the natural environment so amply demonstrates (see, for example, Box 1 of *Curricula Development For Undergraduate University Students*). A number of reasons can be given for this state of affairs. We list below four that are probably most important. In all four people are assumed to be aware, to a lesser or greater extent, of the global environmental issues and problems and of the need to protect the natural environment. However, they cannot, or do not wish to do anything substantive because:

- They fear that adoption of a less consumptive and less polluting life-style to promote sustainable development, as advocated by the Brundtland Commission Report (WCED, 1987), amounts to accepting a lower standard of living which is anathema to them as well as to the political establishment. This is especially true in the rich, developed nations.
- The proverbial “man-in-the-street” presumes that we have enough science and technology to deal with all our environmental problems and that it is government’s responsibility to deploy all necessary resources to that end. However, as we pointed out in Section 4 of *Environmental Education and Awareness*, it is a myth to think that science and technology alone could ever deliver sustainable development. Also, given the weakness of current political leadership to make meaningful progress on the environmental front, it is doubtful how even a modest degree of global sustainability could be achieved before it is too late.
- There is no unique operational definition of sustainable development (see Example 1, Section 4.1 of *Curricula Development For Undergraduate University Students*).

And so, often emphasis is given to street cleaning, management options for post-consumption waste, and so on that do not add up to meet the core requirement of sustainable development, which is to consume less and pollute less in the first place.

- Environmental protection or the finer points of sustainable development are not a priority for the poor or the dispossessed of the world; finding food and shelter is, even if it means having to inflict serious damage to the environment.

Probably as a consequence of the above, acting in concert with other thwarting factors that are variously societal, political and economic (Nath and Talay, 1996), the initial euphoria that greeted Agenda 21 as a road-map to sustainable development appears now to have significantly dissipated. The public at large, and even some environmental professionals, today appear to have adopted a blasé attitude to sustainable development akin to one of stoic resignation. This is amply evidenced by the lack of meaningful progress made to date by the vast majority of nation states towards developing and implementing robust policies for sustainable development. Certainly, this does not augur well for the future of the global environment or quality of life for the vast majority of the world's people.

With reference to what we said in Sections 1.2 and 1.3 of *Curricula Development For Undergraduate University Students*, university teachers have a special responsibility for instilling environmental awareness in *all* their students — graduate and undergraduate in *all* disciplines. However, in order to be able to discharge that responsibility effectively, they must know *what it is that students are to be made aware of*, and *how to instill that awareness so that it would endure throughout their lives*

2. What is it that undergraduate students should be aware of?

2.1. Awareness of Human Limitations

Environmental awareness (or consciousness) usually means being aware of the following: nature, her delicately-balanced life-support systems, and the fragility of both; how diverse human activities for economic development, and mounting pressure of human numbers, have been relentlessly degrading the natural environment and those systems; and an understanding of what needs to be done to alleviate, or eliminate if possible, the resulting environmental problems. We argue, however, that the above, though *necessary*, is not *sufficient* for the environmental awareness that undergraduate students at a university ought to have. Another very important element *must* be added to the above to make it sufficient — it is awareness of the limitations of human beings that are variously spatial, temporal and biological (Nath and Talay, 1996). The need to do so becomes obvious from the following.

We humans are only too aware of our tremendous achievements in all our endeavors such as art, literature, music, philosophy, science, technology, medicine, and so on, and rightly so. But seldom do we acknowledge the limitations of our faculties or of our intellect. However, if we only emphasize our strengths and do not scrutinize our weaknesses, we risk creating a psychologically unbalanced view of ourselves — a view that can make us arrogant about our scientific and technological prowess and even

confer upon us, subliminally or otherwise, some attribute of omnipotence which we certainly do not possess or have any claim to as mere mortals. Typically, the misplaced conviction of the scientific community that global environmental problems could be solved with science and technology, or that science and technology alone could deliver sustainable development (also see Section 4 of *Environmental Education and Awareness*), arguably emanates from a wholly undeserved sense of omnipotence.

“One thing I have learned in a long life: that all our science, measured against reality, is primitive and childlike — and yet it is the most precious thing we have”.

Albert Einstein (1879-1955)

In Sections 2.2 to 2.4 we will describe some of the human limitations that university students should be aware of in addition to the environmental issues of Section 2.5. The purpose of this novel juxtaposition is two-fold: First, to inform students that as science and technology are products of our limited intellectual faculties, perception and imagination, they are also limited, certainly in terms of their ability either to protect the environment or to deliver global sustainable development. And second, to make them aware of the current and evolving environmental issues and problems, and about how society ought to respond to them aiming at sustainable development.

2.2. Reality and Perception

We know from Astronomy, Mathematics and Mathematical Physics that many dimensions of space are possible. The *Big Bang* theory of creation in Astronomy provides a typical example of this. Regardless of the veracity or otherwise of this theory, an understanding of how myriad of galaxies have been moving relative to each other in an expanding universe since the *Big Bang* demands mathematical manipulation in four dimensions of space and of relative motion in that space. Unfortunately, we cannot visualize either, neither can we construct in our minds the geometry of an object in four-dimensional space, let alone in higher dimensions. This is because our perception of the physical world is limited only to three dimensions of space. Limited in this way, the human brain is not capable of processing information relating to or emanating from a space whose dimensionality is greater than three.

There are certain insects and other animals of lower species that lack stereoscopic vision and whose perception of the physical world is confined to two dimensions of space. Their two-dimensional “flat” world is presumably as real to them as our three-dimensional world is to us. This leads to an interesting observation, which is this: We see the familiar form of a cherry tree, for example, complete with its branches, trunk, leaves, etc. However, would its size and shape still look the same to us if our perception of the physical world were, say, in five dimensions of space instead of three? Can we ever find out how the tree would look to an observer blessed with perception in five-dimensional space?

On the basis of what we know, the response to the second question above is “no”. All we can say is that, mathematically, the familiar shape of the cherry tree, as we see it, is

probably a projection (or mapping) in three-dimensional space of its “true” shape situated in a space of higher dimensionality.

What, then, is the true shape of the cherry tree? Does it have a true shape at all? Or, is it not the case that how it appears to an observer depends entirely on observer’s perception as determined by, among other things, the dimensionality of space within which that perception is confined — three in the case of humans? In other words, is it not the observer who *gives* the cherry tree its apparent shape determined by and relative to his own perception? If so, we have to acknowledge that what we observe is only a perception of the “reality” (true shape of the tree in this case) as determined by the constraints of three-dimensional space, our limited senses, and our characteristic brain functions. It is not, and cannot be, reality itself. Like the blind men of Box 1, all we are capable of in this mortal coil is only a perception of reality.

Once upon a time there lived three blind men who constantly argued about what a large animal, called elephant, really looked like. In order to resolve the matter, one day they set out to examine an elephant brought to their courtyard by courtesy of their landlord. They agreed to examine the animal in turn.

The first blind man, who happened to put his arms round the leg of the animal, declared that an elephant was like a tree trunk. The second blind man did not agree. For he had caught the animal’s trunk, and he shrieked that an elephant was like a flexible pipe. The third blind man, who caught the tail of the animal, insisted that both his companions were wrong. An elephant, he insisted, was actually like a smooth, conical spike curving upwards at its end.

Box 1: Reality and perception — the story of three blind men

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Biographical Sketch

Professor Bhaskar Nath received his Bachelor’s degree in Civil Engineering from the Indian Institute of Technology, Kharagpur, India, in 1960, followed by the Ph.D. degree from the University of Wales, UK, in 1964. In 1983 he was awarded the D.Sc. degree by the University of London for his outstanding original research (according to citation) in numerical mathematics. In 2001 he was awarded the *Doctor Honoris Causa* (Dr.H.C.) by the University of Chemical Technology and Metallurgy, Sofia, Bulgaria, for his contribution to environmental education.

After having taught at the University of London for more than 27 years, currently Professor Nath is Director of the European Centre for Pollution Research, London; Executive Director of International Centre for Technical Research, London; Editor of *Environment, Development and Sustainability* published by Springer; visiting professor to several European universities, and consultant to a number of international companies and organizations. Professor Nath’s research interests include Numerical Mathematics, Elasto-Hydrodynamics, Philosophy, Environmental Economics, Sustainable Development, and Environmental Education. He has more than 100 scientific publications in these and related areas including 13 books.