A framework for Value Education of Scientists and Engineers

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ABSTRACT

Technology is generally viewed as the tool for application of scientific knowledge to promote human welfare. Since the age-old problems of inequity, poverty, strife, crime and violence still stare in our face, there must be a grave inadequacy in our science and technology set up. Analysis reveals that the roots of this inadequacy lie in the fact that the youth, the future engineers and scientists, are being given an education that completely sidesteps the whole question of real human welfare, human values and goals. Clearly there is an urgent need to rectify the situation. Though most educationists appreciate the need for education in human values, there seem to be three serious misgivings about it. First, value education is often equated with sectarian indoctrination- an anathema to a secular state like India. Secondly, there is this notion that values can not be taught at all, these are picked up by youth from the environment in which they live, from the inspiration provided by the leaders, the role models. Thirdly, many believe that values are relative and therefore any attempt at ‘teaching’ values is akin to authoritarianism since it would curtail the freedom of choice. This paper provides a framework for value education that overcomes all these objections and shows how students can be motivated to imbibe universal human values through discussions conducted in a rational manner in a classroom.
INTRODUCTION

As the industrial revolution came of age, it was expected that within a few decades the growth of science and technology would ensure that people lead long, healthy and meaningful lives bereft of the worries of providing basic necessities of life. It was expected to free the globe from the strife and turmoil characteristic of the middle ages, and usher an era of peace and prosperity. However, as we move into the twenty-first century, we find that the age-old problems of inequity, poverty, strife, crime and violence still stare in our face. In fact crime and violence seems to have assumed alarming proportions, unheard of ever before. Surely, something has gone wrong. Certainly there has been a tremendous advancement in science and technology, in the knowledge that mankind today has, but somehow this has not translated into freedom from suffering. The reason for this predicament is not difficult to find. As Bertrand Russell succinctly puts it: unless men increase in wisdom as much as they increase in knowledge, increase of knowledge will be increase of sorrow.

This decrease in wisdom is a direct consequence of the pre-eminent importance given in modern education system to gathering information and various practical skills that have a utilitarian value. What the youth are supposed to do with this knowledge, seems to be no body’s concern. No where do we find any discussion on human values and goals. The result as pithily put by Albert Einstein: perfection of means and confusion of the ends characterize our age. No wonder today most people, failing to identify any goal of the life, lead ad hoc lives, motivated only by the instinctual desire to maximize pleasure and become crass hedonists. The whole emphasis of technology development has therefore shifted to maximization of the profits, and not promotion of human welfare. Thus products that are useless, or even downright harmful to the society, are being dumped in the market on one pretext or the other. Arms race, which threatens the very survival of humanity, is a result of this very syndrome.
The need for correcting this situation through incorporation of moral and spiritual education has been repeatedly emphasized by various Education Commissions set up in our country. However, the actual methodology of imparting moral and spiritual education has always been a matter of contention in all secular countries.

Recalling the long discussions the author had with late Prof. D.S. Kothari in early eighties, the main difficulty lies in the apprehension that value education would lead to sectarian indoctrination—an anathema to a secular state. Rather than addressing the issue squarely and taking the bull by the horns, the educationists have taken the softest option: avoid such education altogether. That this apprehension remains intact even today is evident from the numerous articles which have appeared in the national press recently seeing a ‘hidden agenda’ behind the decision of the government to introduce education in human values (EHV) at all levels of the education system.

There is also a fundamental doubt, especially popular among philosophers: how can values be taught? Their implicit belief is that the values can not, and even should not, be taught. These are picked up from the family and the society (the school being a part of it) by observing the role models—be it the parents, the teachers, the film stars or the political leaders. In their view, any attempt by ordinary mortals to ‘teach’ values is tantamount to becoming self-styled moral masters, and this posture itself defeats the very purpose of this education.

In an earlier paper¹ both these issues have been discussed in detail and it has been brought out how education in human values can be given rationally by training the students to analyze their own life in a scientific manner, just as they are trained to analyze the world outside. In this paper, an attempt has been made to build up on these concepts and present a comprehensive framework for value education of students of science and technology.
The Framework

The five cardinal principles on which a sound framework of value education can be based are¹:

i) The foundation of value education should not be made dependent on myth or authority of any kind.

ii) Just as the students are taught “The Laws of Science”, by analyzing the phenomena of the external objective world, similarly they should be encouraged to analyze their own life – its goals, aspirations, etc – in order to discover for themselves the “Laws of Nature” as applicable to the subjective world of Man,

iii) The students should be given practical training to inculcate self restraint, self observation and to develop compassion

iv) The value dimension should permeate all the subjects taught to the students. Good engineering design, a core competence of all engineers needs value judgement.

v) The teachers should be trained to adopt the role of senior students teaching younger ones, and not don the mantle of moral masters.

The first of these principles is a negative stipulation in that it excludes the use of authority - be it of great people, or scriptures - to justify acceptance of any set of values. This is necessary since most scientifically minded modern youth would not accept any injunctions, howsoever valid these may be, merely on grounds of faith or respect for any person or tradition. This is a very healthy attitude, a sure antidote to dogmatism and fanaticism, which needs to be respected and cultivated. In fact one of the greatest spiritual teachers mankind has seen, Gautama the Buddha, advocated this attitude for all spiritual seekers: do not be led by reports or traditions, or hearsay. Do not be led by the authority of religious texts, nor by mere logic or inference, nor by considering appearances, nor by speculative opinion nor by seeming possibilities, nor because one’s own teacher
has said so. When you know for yourself after observation and analysis that certain things are right, wholesome and conducive to the welfare of one and all, then accept them, follow them\textsuperscript{2}. The above quotation also brings to the fore the quintessence of value education: concern for others, concern for the welfare of one and all. It is interesting to see that similar advice was given by the greatest scientist that mankind has seen, Albert Einstein\textsuperscript{2a}.

**How should values be ‘taught’?**

The second principle suggests the approach to be followed for value education, viz. analysis of student’s own experiences facilitated by the teacher. Thus one could begin from an enunciation of the commonly observed Law of Nature: As we sow, so shall we reap. To get mango fruit, we need to sow a mango seed. This is universal truth. One can not get mangoes from sowing any other seed, whatever else we may do after sowing the seed. Similar are the Laws of nature applicable to the subjective world of Man. By asking questions like: “What makes you happy, makes you feel good: greediness or generosity? Honesty or cheating? Getting angry or forgiving? “Apathy or compassion?” the students’ attention can be drawn to the easily verifiable fact that whenever we do anything with a pure mind,- driven by love, kindness, compassion, generosity, etc.,- it gives us happiness, we feel good about it. On the contrary when we do anything with an impure mind-driven by greed, lust, pride, hatred, anger, arrogance, ill will, etc.- it brings us unhappiness, we lose our peace of mind and get agitated. This is also an infrangible law of the nature and is thus universally applicable. We can thus bring out that there are certain universal human values (UHV) --like truthfulness, honesty, compassion, kindness, generosity, etc. which we should imbibe for our own good, to lead a happy and peaceful life. It has been the author’s experience that this method of discussion in class is always very rewarding and drives home the need for imbibing the universal human values.

We can also take recourse to the sense of fair play and justice existing in most youth to draw their attention to the need for imbibing UHV. This can be
easily done by engaging students in discussion on questions like: “How do you feel when somebody deceives or cheats you? Or gets angry at you / forgives your mistake? Steals/returns anything belonging to you? Abuses you/ speaks kind words? And How would others feel when you behave with them in this manner? “ The answers to these questions in the class invariably lead to the fact the maxim: Do unto others as you wish others to do unto you- the so-called Golden Rule of all religions³.

The students of science and technology can also be sensitized towards these universal human values by drawing their attention to the implications of latest scientific discoveries in various fields ranging from physics (quantum mechanics and relativity) to neuroscience, biology to psychology and cognitive sciences, all of which repudiate materialism, and bring out the strong interconnectedness and interdependence of all existence. Thus, as has been discussed in detail elsewhere⁴, quantum physics tells us that we need to “… give up the idea that the world can be analyzed into distinct parts, and to replace it with the assumption that the entire Universe is an indivisible whole”⁵. A simple analysis of the breathing process in a finite atmosphere of the planet earth shows that there exists a chain of chemical contact between all living beings (humans as well as non humans) of the past and the present⁶. We also know now that over 98% of the atoms of a typical human body are replaced annually; the carbon atoms in our body were once the part of the earth and shall be so again in future⁷. The studies of ecologists on various cycles in nature-like the carbon dioxide cycle – which help regulate Earth’s temperature, have brought home the fact that “ there is a tight interlocking between the planet’s living parts-plants, micro-organisms and animals-and its non living parts-rocks, oceans and the atmosphere.”⁸ The recent studies which confirm the powerful effect of mind on the body, not only the mind of the patient but of other person’s mind (e.g. the effectiveness of various techniques of psychic healing, the well documented experiments on the effects of prayer done by others on the recovery of the patient) have led scientists to posit that mind is essentially nonlocal in nature, not confined to the brains and the bodies⁹. If minds are nonlocal, they evidently
become parts of a larger Mind that is boundless in space and time, then each one of us makes a contribution to the larger Mind of humanity. This vision of a nonlocal mind could clearly form a solid foundation for ethical and moral behaviour in the society—for education in human values.

Appreciation of the theory of Evolution also provides an excellent tool for throwing some light on the vexed question of goal of life. It is not difficult to bring out the fact that the whole process of evolution is essentially a progressively clearer and more powerful manifestation of the consciousness. Even dead matter is conscious, as was demonstrated by the celebrated experiments of J.C. Bose, but there is only a faint glimmer of consciousness. At the microscopic level, of course, we now know, there is much greater ‘activity’ with electrons hurling at very high speeds around the nucleus. In plants with their capacity to grow, breathe, and to communicate some more potentials of the consciousness are visible to the naked eye. In animals there is even greater manifestation with sharp sensory faculties, limited ability to learn from experience and elemental levels of ethics like caring for the young. In human beings there is a quantum jump in the awareness and an enormous increase in all potentials. Still, modern neuroscience tells us, Man is using the potentials of only a very small part of the brain, a small part of the left cerebral hemisphere. The right cerebral hemisphere, which functions in a non-linear, non-verbal, intuitive, holistic mode is awaiting further use. It is because of these scientific facts that it is now accepted even by hard core biologists that future evolution of Man would not be biological, but psychosocial. Drawing the attention of students to these facts of science, and encouraging them to inquire into their implications drives home the truth of assertion of great Rishis like Aurobindo who point out that future evolution of Man lies in greater self-fulfillment through movement to higher levels of consciousness or spiritual growth, and not mere accumulation of wealth.

Our experience of two decades of teaching a course on “Science and Humanism” at IITDelhi shows that for engineering students a very effective approach of sensitizing them towards values is to carry out an in depth analysis of the impact of modern technology on society. We draw the attention of
students to the harmful consequences arising from modern technology like ecological damage, vulnerability, urbanization, resource depletion, meaninglessness of jobs, unemployment and resulting social problems. We then encourage them to find the root cause of these problems by first relating these to the basic characteristics of technology like centralization, automation through mass production, planned obsolescence etc. The fact that these characteristics are the outcome of the technologists’ sole concern with increasing profits brings out in a very telling manner the harmful consequences of materialistic world-view, which has fostered modern technology. This prepares the ground for appreciating the need for supplanting it with a more holistic world-view.

**Knowledge of Values and Imbibing Values**

The third principle draws our attention to the important difference between knowing about values and actually imbibing them. Not much would be gained if value education gets confined to class room discussions on the importance of imbibing UHVs without imparting the students any ability to overcome the difficulties in actually living unto these. Significant benefits of value education would accrue only if the youth are equipped with that inner strength that can enable them to overcome the dichotomy so poignantly expressed in the anguish of Duryodhana in the epic *Mahabharata*:

$$\text{Jaanaami dharamam na ca me pravritti}$$
$$\text{Jaanaami adharamam na ca me nivritti}$$

*I know very well what the Dharma is, but am not inclined to follow it. I know very well what the adharma is, yet I can not come forsake it.*

Learning self-restraint and the art of purifying the mind of its baser instincts should therefore form an integral part of Value Education. The most effective, scientific, and universally acceptable method to do so is by cultivating mindfulness of all that happens within the body-mind complex so that one can
really “know oneself”. Such a practice, like the training in Vipassana meditation\textsuperscript{10} produces results within a short time and as the mind gets even little purified, it begins to manifest the dormant characteristics like loving kindness, compassion and reduces anger, ill will, pride and ego. The universal human values can thus be actually imbibed gradually in increasing measure. This is borne out by the feedback from number of IITD students who over the years have been motivated to sit for Vipassana courses as result of our interaction, as also from the feedback received from many school and college teachers who participated in a special 15-day workshop on “Value Inculcation through Vipassana” conducted by the author during summer vacations last year.

**Need for value orientation of all subjects**

Though it seems necessary to introduce special courses where the whole concept of universal human values is discussed in detail, it is also necessary that all other subjects taught to the students also have a value orientation. As mentioned above too, discussing the philosophical implications of various discoveries in science is extremely useful in this regard. Engineering design, which is a core competence of a good engineer, needs value judgement and students’ attention should be drawn to this fact. Even engineering science courses like thermodynamics have highly significant social implications that should be discussed in detail. Similarly in core engineering subjects, as also in all the projects done by engineering students, it would help to point out the ecological and social implications of the technology being taught be it internal combustion engines, hydroelectric power, automation, design of skyscrapers, refrigeration systems, microwave communication or computers. This helps students, the future engineers, to become better engineers and also better human beings.
Teacher Training

The most crucial aspect—indeed a prerequisite—of introducing value education in curriculum is the training of teachers. This is the fifth pillar of our framework of value education. It is essential that the teachers act as exemplars, trying their best to practice what is being taught to the students, and not assume the role of moral masters. All education, but most certainly education in human values, is a life-long affair. None, except a fully Enlightened One, can claim to have completed his value education. Therefore the attitude of teachers “teaching” values should be that of senior students teaching younger ones. It is with this spirit of humility, unambiguously shared with the students, that proper education in human values can be given which benefits both the teacher and the students. Special workshops need to be organized to equip teachers with the abilities needed to become such exemplars by beginning the process of actually living unto these values themselves and also be able to respond to the numerous queries of intelligent youth who, to begin with, see value education with great skepticism.

Concluding remarks

Education in human values can be given in a manner that sidesteps all the objections and apprehensions commonly expressed about such an attempt. At IIT Delhi, a number of such courses have been introduced which have never attracted any criticism of being non-secular or didactic. To increase their effectiveness, what is needed is a comprehensive package of course and practical training modules be introduced so that the future engineers appreciate their social responsibilities and have the strength of character to discharge these joyously. Practical training could include participation in meditation camps, exposure to social reality of the country through camps and padyatras, spending time during summer vacations with NGOs engaged in serving the underprivileged sections of the society etc. This could be integrated with NSS activities
in colleges. Only the youth imbued with concern for others, would be motivated to lend their hands, head and heart to ameliorating the lot of the increasingly larger section of the society getting marginalised due to new social forces unleashed by the policies of LPG (liberalization, privatization and globalization). It would not be an exaggeration to say that the very survival of our society depends on our ability to bring about this change.

References

2. Kalama sutta, Anguttara Nikaya .
6. David Bohm , quoted in above reference, p 84.
7. Murchie , quoted in reference 4, p 87
8. Larry Dossey quoted in reference 4, p 87