

Education for Sustainable Development

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Abstract

The present academics in the undergraduate & graduate levels, particularly in the field of engineering & technology are contextualized to a specific subject area and less focused on experiential learning perhaps due the overcrowded curricula, limited resources for vocational training and lack of institutional drive and commitment. The academics should aim to prepare students to think critically and constructively about the practices of sustainable development and to have the knowledge and skills necessary to build a sustainable future. Sustainable development, stands for meeting the development needs of present generations. It focuses on environmental, economic & social issues and broadly captures the different dimensions of development. When exploring sustainability issues; teachers are encouraged to provide a range of experiential learning opportunities like industry-to-classroom interactions, internships, community services and taking study tours etc. Music can be used for relaxing muscle tension, changing pulse, and producing long-range memories which result in the development of thinking abilities and motivation for learning. Innovating a few divergent and novel ideas and solutions with creativity using some of the out-of-the-box settings for learning instead of the conventional classrooms have also been suggested.

Education is a prerequisite for promoting the behavioural changes and providing all citizens with the key competences needed to achieve sustainable development. Sustainable development is the one that meets the needs of the present without compromising the needs of future generations to meet their own needs. It is about using resources more efficiently and educating people about the issues of sustainable development in order for society to reduce not only its impact on the environment, but on the economy, whilst improving social impacts both locally and globally to ensure a fairer and more sustainable future. Education for sustainable development is about equipping learners with the skills, knowledge and understanding to be effective citizens in a complex and changing world through the curriculum.

Education for Sustainable Development (ESD) is not a separate subject; it is a holistic educational approach. Providers may well present evidence of how they promote the skills needed for sustainable development through teaching and learning. These could include team work, flexibility, analysis of evidence, critical thinking, making informed choices and participating in decisions, all of which will empower learners to voice their opinions and make a difference. Sustainable development broadly captures the different dimensions of development. Traditionally, it is conceptually considered in terms of three main pillars:

- Environmental sustainability
- Economic sustainability
- Social sustainability

It must be emphasized that these are interdependent and mutually reinforcing elements of the same integrated process of sustainable development.

Environmental sustainability

Environmental sustainability is defined as the ability of the environment to continue to function properly indefinitely. The goal of environmental sustainability is to minimize environmental degradation and to stop and reverse the process that leads to environmental degradation. The issues in this area can be

- Climate change issues
- Reduction of greenhouse gas emissions (i.e. understanding the impacts of human activity in particular the burning of fossil fuels on climate change)
- Biodiversity (i.e. stopping biodiversity loss by addressing the changes in natural habitats)
- Energy efficiency (i.e. actions to save energy and developing energy-saving technology)
- Development of clean technology
- Conservation and management of natural resources;
- Waste management
- Pollution (water, air, soil)
- Sustainable transport

Economic sustainability

Economic sustainability is defined as the way to achieving economic growth whilst respecting environmental limits, finding ways to minimize damage to the natural world and making use of the earth's resources in a sustainable way.

A concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders.

- The areas under consideration can be
- Sustainable consumption;
- Sustainable production;
- Corporate Social Responsibility;
- Urban and local development;
- Sustainable tourism;
- Integration of environmental concerns in business decision-making (Green Business);
- Sustainable trade

Social Sustainability

The social pillar of sustainable development is defined as a compilation of actions and efforts to promote development that does not deplete the stock of social and human resources but rather contributes to the enhancement of their potential. The social pillar also refers to the concept of “building sustainable and harmonious communities”.

The area of focus can be

- Health
- Community cohesion
- Social equity
- Demography
- Management of migration and cultural diversity
- Equal opportunities
- Development of human capital and skills

Type of learning and context

The sustainable education can cover 3 types of learning:

- Formal learning: learning that occurs within an organised and structured context (formal education institutions such as schools, colleges, vocational training institutes and universities), and follows a particular structured design. It typically leads to a formal recognition (diploma, certificate). In those cases, the issue of sustainable development tend to be inserted in the curriculum of the institution
- Non-formal learning: learning which is embedded in planned activities that are not explicitly designated as formal learning, but which contain an important learning element, such as vocational skills acquired on the workplace

- Informal learning: learning resulting from daily life activities related to work, leisure, free-time, etc. This type of learning is sometimes referred as experiential learning and can. Generally, it does not lead to certification.

Experiential Learning

Over the years, the topic of learning has been examined extensively and has received considerable attention in educational areas. A no. of pedagogical topics have been published on how experts differ from novices, learning and transfer of knowledge, mind and brain, effectively designing learning environments, and effective teaching and learning. As per David Kolb, "Learning is the process where knowledge is created through the transformation of experience". (Kolb, D.A. (1981). *Learning Styles and Disciplinary Differences*, In A.W. Chickering (Ed.), *The modern American college*)

He represented the theory of experiential learning by a four-stage learning cycle as follows:

- a) Concrete Experience : a new experience or reinterpretation of the existing experience
- b) Reflective Observation : Reviewing & reflecting on the experience
- c) Abstract Conceptualization : Thinking and concluding from the experience
- d) Active Experimentation : Planning and doing what has been learnt

All human beings have a natural propensity to learn; the role of the teacher is to facilitate such learning. This includes: (1) setting a positive climate for learning, (2) clarifying the purposes of the learner(s), (3) organizing and making available learning resources, (4) balancing intellectual and emotional components of learning, and (5) sharing feelings and thoughts with learners but not dominating.

It is important to orient the learning in the preferred style of the learner so that the learning can be more effective. Otherwise the gap of incongruity between the learning and what the students intends to learn will increase which is detrimental to the learning.

A person interested in becoming rich might seek out books or classes on economics, investment, banking, etc. Such an individual would perceive (and learn) any information provided on this subject in a much different fashion than a person who is assigned a reading or class. It is imperative that students are not mere receptacles for knowledge that their teachers deposit, but rather that teachers facilitate a classroom environment that allows students to play a role in creating their own knowledge. The experience-based education is a social process and in this processes the "teacher loses the position of external boss or dictator but takes on that of leader of group activities"; as observed by Dewey, John.

1. According to Dewey, democratic leaders of classrooms need to be "intelligently aware of the capacities, needs, and past experiences of those under instruction, and secondly, to allow the suggestions made to develop into a plan and project by means of the further suggestions contributed and organized into a whole by the members of the group." (Dewey, John, *Experience and Education*. New York: Kappa Delta Pi. Kindle Edition.)

As teachers listen to suggestions from the students they are not obligated to put all thoughts into action. They must use their own intelligence and experiences to recognize in the concrete what surroundings are conducive to having experiences that lead to growth.

- Significant learning takes place when the subject matter is relevant to the personal interests of the student
- Learning which is threatening to the self (e.g., new attitudes or perspectives) are more easily assimilated when external threats are at a minimum
- Learning proceeds faster when the threat to the self is low
- Self-initiated learning is the most lasting and pervasive

The reasons why experiential learning is effective are:

- a) All participants in an experiential learning program are equal in terms of their knowledge and skills with regard to the tasks at hand. This creates a sense of equality among the participants, which is favorable for effective learning.
- b) Experiential learning programs help you learn how to quickly build a relationship. When resolving unfamiliar challenges collaboratively with a group of unfamiliar people, you quickly find ways to build relationships. This strengthens your communication, collaboration and interpersonal skills.
- c) In experiential learning, you are taken out of your comfort zone. When handling unfamiliar challenges, you learn how to focus on task and process related themes, and how to organize yourself around a challenge. Learning becomes more effective because most of your prior experiences are irrelevant in the present context.
- d) When you participate in experiential learning programs, you get an opportunity to improve your Meta learning skills. With improved focus on your process of learning, you get the space and flexibility to review your leadership skills, problem solving skills, communication skills and so on.
- e) You learn how to manage crises in an environment that is safe and supportive. This enhances your crisis management skills in real life situations.
- f) Rather than only listening and viewing, the kinesthetic learning method requires a learner to perform physical movements. Experiential learning incorporates kinesthetic learning methodology, thus ensuring holistic improvement of your mental, behavioural and physical strengths.

Experiential learning can be incorporated in many ways:

1. Group project assignments from the industry

Group projects under an experienced guide can help students develop a host of skills that are increasingly important in the professional world. Positive group experiences have been shown to contribute to student learning, retention and overall college success.

Properly structured, group projects can reinforce skills that are relevant to both group and individual work, including the ability to:

- Break complex tasks into parts and steps
- Plan and manage time
- Refine understanding through discussion and explanation
- Give and receive feedback on performance
- Challenge assumptions
- Develop stronger communication skills.

Group projects can also help students develop skills specific to collaborative efforts, allowing students to:

- Tackle more complex problems than they could on their own.
- Delegate roles and responsibilities.
- Share diverse perspectives.
- Pool knowledge and skills.
- Hold one another accountable.
- Receive social support and encouragement to take risks.
- Develop new approaches to resolving differences.
- Establish a shared identity with other group members.
- Find effective peers to emulate.
- Develop their own voice and perspectives in relation to peers.

2. Industrial Training in the curriculum

Mandating industrial training as a partial requirement for the fulfillment of the award of engineering degree is the need of the hour. The field of engineering is among the oldest disciplines to promote internships, with roots beginning in the early 1900s. The benefits are numerous for both students and employers. Some companies may want to hire all entry-level engineers through internship programs while others simply want help to complete a short-term project. Regardless, having access to top students before graduation is an effective way for companies to recruit the most talented individuals, all while utilizing a low-risk, inexpensive technique.

The industrial training has the following objectives:

- to develop an appreciation of the structure and operation of an industrial organization
- to understand the role of the engineer and engineering in industry
- to appreciate the importance of good communication and interpersonal skills, and to develop these skills
- to foster creative thinking, initiative & resourcefulness
- to appreciate the ethical basis of engineering practice in industry
- to understand the importance safety & environment
- to infuse concepts of human resource management
- to contribute to the productivity of the employers and national development immediately after graduation

The benefits of an industrial internship are:

- Applying classroom experience and converting academic knowledge into industry skills
- Gaining confidence in the knowledge acquired in the academics
- Gaining valuable hands on work experience which is not available in classrooms

- Having an edge in the job market
- Possibility of transition into a job

The faculty should backstop student involvement in learning in the life size environment of nearby industrial institutions, research laboratories, pilot plants and engineering workshops etc. by mandating undergraduate students to take practical training in any of the areas of employable vocations. The training programmes would also involve lectures by subject matter specialists on technology, communication skills, business management, quality standards, management, cost reduction, social and environment issues etc. This way the training will infuse and strengthen conceptual learning with technologically advanced practices for field applications. In totality, training is expected to build practical skills and business management knowledge in all aspects of a vocation.

Unfortunately, although appreciation for experiential learning is more of rhetoric in the existing undergraduate course curricula, actual facilities & opportunities provided by engineering colleges India for learning by vocational training or hand-on-training are either non-existent or exist in a very rudimentary stage of development.

3. Vocational Training

Vocational education consists basically of practical courses through which one gains skills and experience directly linked to a career in future. It helps students to be skilled and in turn, offers better employment opportunities. These trainings are parallel to the other conventional courses of study in graduation/postgraduation. Time management and meeting deadlines play an important role in success in a vocational course and during their studies students normally produce a portfolio of evidence (plans, reports, drawings, videos, placements), which is taken as a demonstration of students' capabilities for a job. After finishing the courses, students are often offered placements in jobs. Vocational trainings in a way give students some work related experiences that many employers look for.

4. Exposure to the working of non-educational institutions

Financial institutions like banks or state administration such as water works, department of roads & buildings, power generation & distribution etc. provide excellent hands-on-experience to the under graduate students. The benefits are numerous for both students and employers ---- while these institutions benefit by getting extra assistance from knowledgeable students who bring a diversity of ideas, students benefit by forming valuable personal and professional relationships that could last a lifetime.

James W. Gentry observes that “the experience needs to be structured to some degree; relevant learning objectives need to be specified and the conduct of the experience needs to be monitored. Students need to evaluate the experience in light of theory and in light of their own feelings. And, process feedback needs to be provided to the student to complement (and possibly supersede) the outcome feedback received by the student.”(James W. Gentry, *What is experiential Learning?*, <http://www.wmich.edu/casp/servicelearning/files/What%20is%20Experiential%20Learning.pdf>)

The students after the industrial or the vocational training need to submit a report on their experience and learning; and share their experience with others in the form of seminars to enhance their presentation skills as well.

5. Focus on community service

If today's college graduates are to be positive forces in this world, they need not only to possess knowledge and intellectual capacities but also to see themselves as members of a community, as individuals with a responsibility to contribute to their communities. They must be willing to act for the common good and capable of doing so effectively. Education is not complete until students not only have acquired knowledge but can also act on that knowledge in the community they live. There are numerous areas of community service where the students can be made to focus on; different from the didactic monotony of classwork; such as health care, sanitation, adult education, abolition of child labour, fighting drug addiction, etc., Although less tangible in terms of financial gains, by participating in service projects, students forge bonds with each other, as well as other members of the community. These bonds enhance their interpersonal skills and increase their social network. Additionally, volunteerism can lead to increased care for others and a desire to cooperate and get involved in positive ways.

6. Experiential learning through meditation

Meditation is a state of profound, deep peace that occurs when the mind is calm and silent, yet completely alert. It is not just the mental concentration on something that gives us peace or satisfaction as it is generally conceived. In reality, meditation is a state of thoughtless awareness, not an act of doing. This is just the beginning of an inner transformation that takes us to a level of high awareness. This enables us to fulfill our true human potential. The field of experiential education can be enhanced through the use of meditation. The teacher must have the skills to cultivate peace of mind--skills provided through the ancient tool of meditation during the process of which each individual in the field is encouraged to become a just and compassionate person. Mindfulness meditation has no religious or ideological connotations and has the primary goal of bringing understanding into one's own thoughts and actions through a calm and focused mind and can be integrated into experiential education in the classroom and outdoors.

7. Music-based learning

“An intelligence is the ability to solve problems, or to create products, that are valued within one or more cultural settings”---(Howard Gardner –*Frames of Mind : The Theory of Multiple Intelligences* (1983).

Arts-based teaching promotes effective development by increasing the learner's interest, motivation, and enthusiasm for learning. Music based instruction develops neural systems. Its influence on neural systems is another way to associate arts with learning. By engaging the brain, the music enhances neurobiological systems that support cognitive, emotional, attention, and immune systems. Music has been found to synchronize neural firing patterns. Instruction in music promotes and maintains this synchronicity, which increases the efficiency and effectiveness of the brain.

Music increases the neural activity in the right hemisphere of the brain. In a relaxed state of awareness, the mind is able to absorb and assimilate information much more readily and quickly than in the more normal state. The primary factors that influence

and moderate brainwave patterns are sound, especially music, and vibrational patterns, especially rhythm or beats. Millions of neurons can be activated in a single musical experience. It is through the activation of these neural connections that learning takes place. The more neurons that can be connected, the greater the learning potential.. Music is a way to use a multi-sensory approach to learning that can enable students to absorb content with a relaxing and creative vehicle as a catalyst.

8. Learning by meditation

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Meditation enhances awareness which culminates into transformation & evolution. "The development of awareness is a fundamental pedagogical theme and it is the main goal of meditation as well: that is why we can speak of meditation as education. What we have to learn when we do mindfulness meditation is nothing else than being able to use our awareness to deepen our presence in the world. It is the embodied presence – embodied mind – which gets improved by meditation; it is a sort of cognitive posture that had to be educated, a new perspective on the world grounded in the lived experience;" observes Francesconi (Denis Francesconi, http://www.academia.edu/2049382/The_Embodied_Mind_Mindfulness_Meditation_a_s_Experiential_Learning_in_Adult_Education)

9. Learning in the moonlight by the seashore

Over the decades there have been many scientific reports for and against the effect of the moon on human behaviour. All objects including stars, planets and satellite bodies along with their gross attributes emanate subtle and intangible frequencies. These physical attributes and subtle-frequencies affect us in varying degrees at a physical and subtle-level.

The frequencies emanating from the moon affect the frequencies of the mental body, i.e. mind of human beings. By 'mind' we mean our feelings, emotions and desires. The mind consists of the conscious mind and the sub-conscious mind. Within the sub-conscious mind we have a number of impressions that are embedded that decide our basic nature and personality. We are however not aware of the thoughts or impressions in our sub-conscious mind. These impressions in our mind are the catalysts for all our thoughts and subsequent actions. Both the impressions and our thoughts have their own subtle-frequencies and when they match the human mind is drawn to a mystical world consisting of channels that help us to meet our essence. The mystical experience encourages us to discover our unique sensibility. It connects

us to the universe and defines our role in the world. It is in this sense a step that allows us to recognize our mission, this deep desire inside that makes us want to become what we truly are. Neurologically, the mind, instead of hopping impulsively and at random from one thought to another, often in a state of considerable agitation, is invited---rather than compelled---to focus on fewer thoughts or indeed just one, thought or image. Through meditation, the learners reach a cognitive maturity which reflects the ability to calm the mind, to live a state of rest and control on the flow of consciousness. This will enable the learning more effective.

10. Learning in a graveyard

Mysticism is the pursuit of awareness of an ultimate reality, divinity, spiritual truth, or God through direct experience, intuition, instinct or insight. It usually centers on practices intended to nurture these experiences. Even the eerie and uncanny silence of a grave yard can prove to be an effective class room. The tombstones sometime we see have cognitive inscriptions on them which foster imagination and elicit innovative ideas. When we see a dead body in the graveyard put on a pyre we actually pray to God to allow the soul which detaches from the mortal remains to rest in peace and at the same time we accept the rule that death is the ultimate reality for all of us. This humbles us, our egos, irrespective of our social or economic status and how knowledgeable we are.

"Hypocrisy, pride, self-conceit, wrath, arrogance and ignorance belong, O Partha, to him who is born to the heritage of the demons." (The Gita, XVI. 4).

While pride harms only the proud, arrogance due to overbearing pride brings contempt for others. An arrogant man is often rude and very fond of offending his friends, relatives, colleagues and everyone else who comes in contact with him.

The ego of wealth, knowledge, clan & youth is the human's self-imposed infliction, his highest burden and hinders the evolution. The learning in the mystic setting of a graveyard is another unconventional, yet very powerful platform for transformation.

11. Learn while you travel

An experiential travel introduces one to the life beyond the experiences many tourists face and opens a whole new world of evolution. Travelling to distant locations inside the country & abroad, living in different terrains, experiencing varying climates, coming to new cultures and interacting with strangers teaches one as much about oneself as it does about other people. The challenge of new experiences will push one's personal barriers back and unravel misconceptions. You cope with situations that have not been previously encountered with; you interact with people with different expressions, emotions, customs & lifestyles.

An experiential travel is that which moves you, connects you with the people and the culture of that place such that it enriches you and changes you; and has a positive impact on how you perceive your environment and interact with your friends. When you walk away from an emotional journey, you take something very important back with you, the empathy---one of the building blocks of the human condition.

Conclusion

Experiential learning is participative, interactive, and applied. It allows contact with the environment, and exposure to processes that are highly variable and uncertain. It involves the whole-person; learning takes place on the affective and behavioural dimensions as well as on the cognitive dimension. The experience needs to be structured to some degree; relevant learning objectives need to be specified and the conduct of the experience needs to be monitored. Students need to evaluate the experience in light of theory and in light of their own feelings. Experiential learning provides students with the motivation necessary to put forth effort in academics, it gives them more opportunities to integrate and elaborate on their knowledge, and it increases the likelihood of transferring theoretical knowledge to actual practice.

Certain unconventional settings for the classrooms, incorporating spirituality in the learning styles have also been suggested to make the learning a lifetime experience.

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