Fostering Social Innovation into Engineering Curriculum for Building an Effective Student's Engagement with Society

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Abstract -The present challenge of engineering education in India is to develop social concern, problem solving and leadership skills in undergraduate students. The learning experience created through a well designed course at the early stages of their program will help the students' to develop better capabilities to find technological solutions to the societal problems. To achieve these outcomes a course on 'Social Innovation' was designed and delivered at the first year level of undergraduate engineering programs at B.V. Bhoomaraddi College of Engineering and Technology (BVBCET). This paper presents the experience of BVBCET in design and delivery of this course.

The basic objective of the course is to prepare the students to develop an awareness of key social issues facing the local community and identify areas ripe for innovation. In the process the students acquire the requisite skills to tackle the problems through innovative and sustainable solutions. The course also builds communication, analytical thinking and decision making skills into the students, to make them more effective and creative leaders. The student groups work on societal issues by analyzing the cause and effects, understanding the strength and weaknesses through SWOT and finally arrive at solutions. The developed solutions are piloted in the field to understand their impact on the community. Every year over 200 student lead, social innovation projects are carried out by first year engineering students.

Key words: Social Innovation, IBPS tree, SWOT analysis, Stake holders.

Background:

Inspired by engineering projects in community services, EPICS (1), which is an engineering design program that operates in service learning context, practiced at PURDUE University, and along with the challenges posed by engineering education in India to develop social concern, problem solving and leadership skills in undergraduate students, a course on social innovation was designed in the year 2009. In the initial period the hand holding was extended by Deshpande Foundation for Social Entrepreneurship.

Course Design

The course on Social Innovation offered to the students of First Year under Graduate Engineering Programs, has been designed for effective learning through which the students engagement with the society is established. It is a core course with 2 credits.

The course is an open ended course providing opportunity to the students to learn the process of Innovation through knowledge, tools to analyze the data, experiential sharing followed by visits to many Non-Governmental Organizations (NGO).
The course provides the fivefold opportunity to the students to acquire the required social awareness.

1. Exciting social challenges: Students get an opportunity to communicate with the society and identify the social issues.

2. Compelling context for engineering /social design: Students are empowered to apply their creative mind to arrive at the solution.

3. A multi disciplinary team experience: The course creates scope to work in teams which enhances their socially responsible leadership qualities.

4. Sufficient time to learn and practice professional skills: Spread out over the entire semester will provide sufficient time to learn and apply their professional skills.

5. Personalized mentoring: Effective monitoring is practiced with class strength of 35 students and one faculty.

Figure 1: Fivefold opportunity in Social Innovation

At the end of the course the student will be realizing the following outcomes:

i) Develop an awareness of key social issues faced by the local community and identify areas apt for innovation.

ii) Acquire the requisite skills to tackle social issues through innovative and sustainable solutions

iii) Design new services/products that can improve the quality of life of individuals and communities in local areas.

iv) Build communication, analytical thinking and decision making skills to become more effective and creative leaders.

v) Enhance knowledge of IT applications to be more competitive in a globalizing economy.

Course Delivery

The following table illustrates the course delivery pattern. Through well defined modules the process of social innovation is explained to the students. The activities mentioned, experiential sharing process and visits compliments the learning process. Every delivery session is scheduled for 90 minutes.

Modules	**Objectives**	**Parallel Sessions**		
		Activity	**Experiential Sharing**	**Visits**
Introduction to social Innovation	*Basic understanding, Role of Engineering in social innovation (2,3)*	Behavioral Blocks- *Identify the barriers to innovation with individual and know the remedial measures*	Critical Issue Awareness	Akshaya Patra- A NGO providing Mid-Day meal to more than 2 lakh students every day
Identifying Local Issue and Idea Generation	*Engaging with society, observation, idea pitching and justification*			
Issue Based Problem Solving	*Identifying effects and related causes*			
SWOT Analysis	*Study the effects of Strength-Weakness-Opportunity and Threat for the relative causes*	Innovative Resource Management-An activity to learn how to do more with limited resources	Critical Issue Awareness	Agastya Foundation- An organization demonstrating various models to understand how science
Stake Holder Analysis	*Identifying the requirements of stake holders*			
Innovative Fund Raising	*Budgeting and plan for fund raising*			Samarthanam - A NGO involved in helping

				physically challenged people.
Implementation	*Applying the solution in the area identified*	Calculated Risk Management- An activity to teach how to deal with risks.		
Feedback	*Collecting inference from the stake holders*			

The students' engagement with the society and class room learning goes hand in hand. The journey of social innovation begins with the group formation. Every group has 4-6 students. With lot of interaction and brain storming among the group members, every student group documents their idea. The following template is being used to document the idea generated by every group.

Social Issue Identified	
Theme	Health Education livelihood Agriculture Technology
Key Objectives	
Details of Stake holders/Beneficiaries	
Outcomes	
Constraints: (if any)	
Budgeting and fundraising (Optional)	

Table 1: SOCIAL INNOVATION IDEA GENERATION TEMPLATE

The main focus of the course is to teach the students to know the causes rather than working on the effects. Issue based problem solving tree is used as a tool to know the effects and their related causes. Cause and effects of an issue identified can be understood clearly by drawing an Issue Based Problem Solving (IBPS) tree as shown Figure 1.

Figure 1- Issue Based Problem Solving Tree

Students recognize the cause for which the solution is to be identified. Each cause identified is subjected to analysis, based upon the time, resources available and the capability of the team members, students zero down to one cause to work on. The alternate solutions identified to overcome the causes are further subjected to SWOT analysis to know the feasible solution. The direct and indirect stake holders are part of the solution. Final plan includes budgeting and fund raising. The students complete the entire process in 16 weeks as indicated in figure 2 with actual implementation and collection of feedback.

Figure1- Time distribution for activities in a semester

Course Assessment:

Continuous internal evaluation method is followed for the assessment of the students. The assessment is done through phase wise presentation, assignments, minor examination and semester end examination.

Course projects:

The themes on which the students work generally fall in the following proportionate.

Figure 3- Distribution of project themes

Every academic year generates more than 200 student projects. The following list exhibits some of the social innovation project titles.

Sl.No	Project Title
01	SIMPLE SIPHON SYSTEM
02	PAPER LOG MAKER
03	SCIENCE MODEL
04	WATER BOILER
05	UN USED CLOTH MANAGEMENT
06	HANDY CYLINDER CARRIER
07	SUPERSTITIOUS BELIEFS IN DAILY LIFE
08	ATITHI DEVO BHAVA
09	LACTO MACHINE
10	A DOCUMENTRY ON SOCIETAL PROBLEMS
11	OTTO WATER PUMP
12	SENSO STICK
13	CONSUMER AWARENESS
14	CREATING INTERNET AWARENESS AMONG D.ED & B.ED STUDENTS
15	ELECTRICITY FROM SPEED BREAKER

Conclusion

The experience of BVBCET in design and delivery of Social Innovation course has been very exciting and satisfactory. The course has been successful in developing social concern, problem solving and leadership skills in undergraduate students. The learning experience created through this course at the early stages of undergraduate engineering program, has helped the students' in developing better capabilities to find technological solutions to the societal problems.

The students have demonstrated an awareness of key social issues facing the local community and are able to identify areas ripe for innovation. In the process of doing this course students' have acquired the requisite skills to tackle the problems through innovative and sustainable solutions.

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