10.16920/jeet/2023/v36is2/23065

# Community Engagement - An Invaluable Tool To Enhance Student Skills

**Prasanna Nambiar**
Don Bosco Institute of Technology, Mumbai, Maharashtra, India

***Abstract*—The engineering curriculum provides the student with a sound base in the core fundamental aspects of the programme, but several workplace skills like empathy, team working, creative problem solving, innovation, adaptability, agility and so on are not formally provided. However engineering colleges can impart these skill innovatively through Value Added Courses and students projects. A Tier-II undergraduate institute in a metropolis has been promoting projects on sustainability and community development to provide opportunities for its students to imbibe the lateral skills mentioned above. The institute has been following a well defined process, which includes field studies, design thinking, creative problem solving, with very encouraging and commendable results. The process begins in the second year of engineering and terminates with the final year project.This paper discusses through two projects undertaken by the students, the process followed. The lessons learnt are invaluable to the students as they learn to apply their knowledge to real life problems. The institute gets greater visibility and recognition and the community benefits through better understanding of its problems.**

***Keywords*- Community, field studies, design thinking**

***JEET Category*— Practice**

## I. INTRODUCTION

Skills for the workplace have evolved over the years and place demands over fresh graduates to engage in activities that help them develop abilities of problem identification, thinking out of the box, engaging with multi-cultural and multi-disciplinary teams, identifying user needs through empathy generation and so on. In most institutes none of these skills are learnt formally through the curriculum.

A Tier-II institute located in the metropolis has as part of its vision statement 'Developing socially conscious individuals who are empathetic to the needsof the community and engage in sustainable engineering'. To achieve this vision it has consciously been engaging its students in projects that solve the problems of the community. To ensure student involvement in the true spirit of community engagement, the students are groomed over 2-3 years in the necessary tools and techniques.

A process is put in place as follows:

1. Introducing students to local communities
2. Engaging students in innovation and creative thinking
3. Introduction to tools and techniques of research including IPR
4. Product design and development of prototype
5. Deployment and feedback gathering
6. Rework and scale-up

This exercise is being carried out over the past 5 years and has prepared the students to identify and handle problems that are open ended and do not have well defined solutions. These problems are community specific; what works for one community may not work for others.

All these aspects prepare the student with important skills for the workplace. The joy of addressing community needs and providing a solution is an added advantage.

## II.ASSESSING COMMUNITY NEEDS

Local communities are an invaluable asset to a city as they provide the human resources for the city's needs. However many communities live in appalling conditions with minimal access to water, sanitation and hygiene. Many lack basic education and struggle to earn a livelihood. The COVID pandemic made these communities even more vulnerable and deprived them of basic human dignity.

On the outskirts of the city too there are communities which are deprived of basic amenities like health service, primary and secondary schools, transportation, etc. Women walk several kilometers each day in search of firewood or to carry water for their daily needs. Girls drop out of school on reaching puberty. Infant mortality and malnutrition are perennial problems.

The college introduces its students to these communities during the first year and second year through field visits and week long camps during which they interact with the community members. Students live with the local families for 2-3 days and share their meals and delve deeper into their culture and tradition. They participate in the PRA (Participative Rural Appraisal) activity, attend the gram sabha meetings, conduct skills training for the local youth and women, engage the local school children in academics, sports and cultural activities.

Before leaving the communities they already have identified a list of challenges to work on.

## III. Building Skills and Developing Empathy

### *A. Building Skills*

Most of the community problems can be classified as WICKED problems[1], which are ill defined, open ended, have multiple stakeholders with varying requirements, are politically and socially influenced. They require innovative solutions.

The problems are human centric and require Design Thinking tools to be employed. The students are trained in innovation and creative thinking through a 20 hours programme. The Design Thinking training is conducted for another 10 hours[2]. However to apply the skills the students have to move in the community and gather deeper insights.

### *B. Developing Empathy*

Students living in the comfort of their living spaces in metro cities have little inkling of the challenges of rural and slum lives. Developing empathy is crucial for which the students spend time interacting closely with communities.

In the Fig.1 seen below, the students studied the problem of women and girls who balance multiple vessels of water on their head over long distances and hilly terrain. To understand their pain the students tried balancing just one vessel of water , which they found difficult and painful.

Fig.1Students carrying pots of water

Another problem taken up was to provide dignity to conservancy workers who clean drains in the city slums. A nearby slum was taken up for a pilot project. Many of the drains are inaccessible for machines and have to be cleaned manually.

The conservancy workers and labourers assigned the task are provided with very rudimentary tools and no protection. Very often they end up using their bare hands for cleaning and injuring themselves in the process. They are prone to various skin diseases and have no access to medical care .Fig.2 shows the condition of the drains

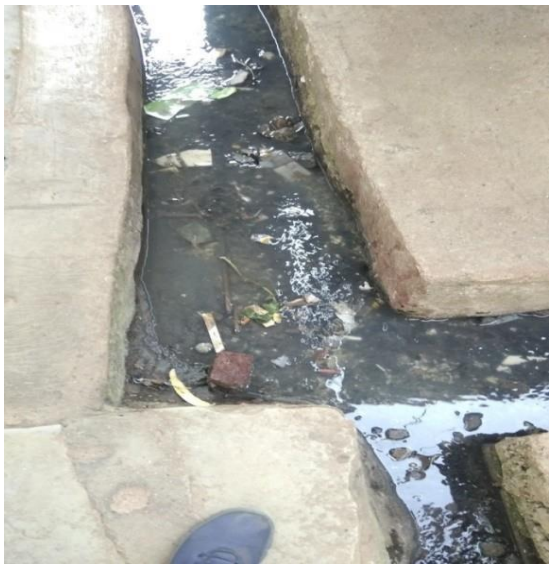

Fig.2 Narrow drains in slums

## IV. FIELDWORK AND DATA GATHERING

Students spend several hours with the community to understand their culture and tradition, lifestyles, food habits, literacy levels, superstitions, interactions within the community[3]. All these help in winning the trust of the people to discuss their problems.

Student teams gather data through surveys and community interaction and place their findings before the community. The problems are prioritized with the inputs from the community.

Rural women complained of neck and lower back problems due to prolonged load carrying over long distances [4].

The conservancy workers complained of fatigue due to constant bending to clean narrow drains with their bare hands as well as skin rashes and allergies.

## V. EXPLORING MULTIPLE SOLUTIONS AND DEVELOPING PROTOTYPES

Using their knowledge of engineering and the insights from the community interactions the students explore multiple solutions and create prototypes which are taken back to the community for trials and feedback.

Ergonomics, load distribution, stress analysis, multiple utility, ease of manufacture, ease of operation, materials selection, user experience, all play a role. The students get to explore all aspects of their curriculum at a deeper level.

An iterative process from prototype to user validation of a water carrying contraption is shown from Figure 3 to 5.

*A. Water Carrying Trolley*

Fig. 3 First prototype of the water carrying contraption

Fig. 4 Final prototype of water carrying trolley

After several deliberations with the community and understanding the fundamentals of load distribution, a single wheel trolley was designed. The complexity of the terrain made a two wheeler trolley inconvenient to operate. As shown in Fig.4 the trolley was provided with handle bars for pushing it, and a platform was provided to place the water can. A simple fastening mechanism was used to fasten the water can. The handle bars also allowed for resting the trolley. The entire assembly was made of used rods and welded locally. This was done to enable the locals to fabricate it for their use.

Fig.5 User validation of the trolley

The women expressed their willingness to try out the product. Futher trials were not carried out due to COVID restrictions.

*B. Drain Cleaning Equipment*


Fig.6 Prototype of drain cleaning equipment

After several studying several designs the above tool was designed to assist labourers in cleaning shallow drains. The tool comprises of a grabber at the base and a scissor mechanism for operation. This helps collect the waste including silt with minimum effort and requires no

bending. The design is robust and flexible.

Fig.7 A labourer trying out the equipment

The workers were comfortable in using the equipment. However they expressed concerns about handling and storing it after use. The students discussed the matter with the authorities of the solid waste management division and were asked to submit their design for further processing.

## II. CONCLUSION

Encouraging students to engage with the community has multiple benefits for the student, the community and the institute. Students have to think out of the box right from the problem definition stage. They come out of their comfort zone and learn to empathize with the underservedcommunities and delve deep into their problems. They apply their engineering knowledge to real life problems and learn to deal with challenges that are open ended. Their skills of design and development are tested extensively. They also learn to win the confidence of the community and engage them in co-creating the solution. They need to communicate with the community at every stage and get their endorsement. The designs discussed in the paper can be evolved further and can be patented. They can also lead to a startup. The process builds confidence in the students to approach a complex problem and find a workable solution. The experience helps them extensively while seeking a job or applying to universities for higher studies.

The institute benefits by realizing its vision of developing socially conscious engineers who engage in designing sustainable solutions for the community which leads to greater visibility and recognition.

The community benefits by being able to voice its issues and getting an external perspective for its problems. It get an opportunity to engage with young minds to co-create solutions.

## REFERENCES


1. Jon Kolko, 'Wicked Problems: Problems Worth Solving: A Handbook and a Call to Action',ISBN:978-0-6155931-5-9
2. J.Liedtka, R. Salzman, D. Azer, 'Design Thinking for the Greater Good,' Columbia University Press.
3. Tony.L.Whitehead, 'Basic Classical Ethionographic Research Methods', EICCARS Working Paper Series, University of Maryland
4. Jo-Anne .L.Geere, P.R.Hunter, P.Jagals, 'Domestic water carrying and its implications for health,' Environmental Health 9, Article No. 52 (2010)