

# *Increasing the Understanding of Engineering Education for Freshmen*

## *Pedagogical Innovation in the form of Induction Program*

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**Abstract—** India produces a large number of engineers every year. But industry leaders constantly complain about the absence of quality engineers for their industries. The future success of Indian industry depends on the growth of quality engineering education (EE) in India, especially since Indian industry is competing globally in software, and in areas such as automobiles, chemicals and engineering equipment. In India, majority of students opt for engineering after their 12th standard. A very high percentage of this majority opt for engineering succumbing to peer pressure without any prior knowledge on the profession and discipline. This results in freshmen students unable to cope with the curriculum from the very first year of study. This keeps piling up till their final year which results in lack of quality engineers graduating from colleges. Making efforts to address this crisis at the beginning would be the right time and would stop the problem from escalating. This paper discusses an initiative which was designed to address this issue for freshmen students.

**Keywords—** Induction Program, Engineering Education;

### I. INTRODUCTION

Engineering has been one of the major fields of science pursued as education and also as a career by the greater percentage of students in India. There are over 610 universities and 31,320 colleges producing over 14,624,990 enrollments every year [1]. Notwithstanding the unpredictability, the IT Industry has remained the largest job provider over the past 15-20 years. According to Aspiring Minds (an employee assessment service provider) 2012 National Employability Report, 83% of engineering graduates are unfit for employment [2]. The report also suggests that the students are ill-equipped in communication skills, confidence, presentation, problem-solving capabilities and generic abilities; an alarming figure presenting hard reality has been brought out in notice. The report also revealed that over 50% graduates fall short of the mark in language and grammar as well.

The Industry Readiness Index survey conducted by PurpleLeap in 2013 (company skill bridging support for

students pursuing engineering courses) indicates that only 10 per cent of the engineers passing out of from Tier 2/3 colleges in India are employable. Even with the intervention programs, the students struggle, primarily due to poor communication and/or analytical/problem-solving skills.

One of the outcome of evaluating the root cause of this problem indicated the lack of awareness of EE among first year students when they opt for engineering as their next level of education. Majority of the students decide their field of expertise based on the availability of seats in the college, peer pressure and not based on their interest, due to which the student finds it difficult to cope with their field of study as they begin their 2nd year in college.

### II. INDUCTION PROGRAM.

Addressing this issue before the start of classes by providing the students an insight on EE and their discipline would contribute towards overcoming the problem. After evaluating the incoming first year students based on their level of understanding on EE and engineering discipline, communication skills and their background, a 3 day induction program was designed at KG Reddy college of engineering and technology. Apart from providing the students an overview of their course, the main goal of this program was to help students overcome their networking barriers, strengthen the relationship with the faculty and provide hands on experience on live engineering projects. At the end of the program, the students were expected to have an understanding on their 4 year engineering curriculum, develop an insight on their engineering discipline, future career prospects and an overview of the facilities which can be availed in the college to make sure resources provided are maximum utilized.

#### A. Day 1

The day 1 of inducted program started with a presentation by the principal. He spoke about the college's mission, vision, rules and regulations. This was followed by a presentation from the placement director in which he shared with students about the expectations of industry and the skills they need to be

equipped with at the end of 4 years. The 3rd session of day 1 was conducted by 2 alumni of the college where they spoke about their 4 years' experience and what the students can expect in the 4 years. They also spoke about the importance of maintaining a good balance between academics and extracurricular, and how to plan their schedule for maximum optimization. This session provided the students an overview on 4 years college life. The next session after lunch was a campus tour, students were taken around and shown the various facilities available and which could be availed by the students.

### *B. Day 2*

The second day of the induction program started with ice breaking sessions which went on till afternoon. The ice breaking sessions were conducted to help the students come out of their comfort zone and interact with others. During the ice breakers, all students were divided into groups of 5 which gave them a chance to work in a group, express their ideas and bring out their creativity.

After lunch, all students were directed into different rooms based on their discipline. An introduction on their respective engineering discipline was given emphasizing on future career prospects and research opportunities which could be availed after graduation. This was followed by presentation on the course structure, curriculum and credit system. This was conducted to help students get an outline on the core areas of study in their respective disciplines. They were then divided into groups with a faculty assigned to each group. All students then discussed their queries with the assigned faculty and clarified their doubts.

### *C. Day 3*

The last day of induction program comprised of separate departmental activities where students were supposed to work on live projects corresponding to their respective chosen discipline.

1) *Department of Civil Engineering:* An activity was designed to help students understand few civil engineering principles which are used during construction. The participants were explained the properties of cement and the reason for its wide usage in construction. They were then shown videos on mixture of concrete. Students then designed and constructed a wall using bricks, stones and concrete. All the materials were provided and they were asked to build a wall from scratch. Students were very enthusiastic after the activity as they got to build something useful out of scratch.

2) *Department of Computer Science Engineering:* Two different activities were conducted in department of computer science. Both activities were focused on interactive based learning. The first activity aimed at providing the students with an introduction of web/internet technologies used in creating websites and creating different display effects on web pages using basic HTML tags. Students were divided into groups were made to plan, design and implement a colorful web page. They were then taught about effective and efficient use of the search engines such as Google, Yahoo, Bing while

browsing the Internet. The activity provided them a basic knowledge on HTML and tips for target oriented browsing. In the second activity, students were taught about basics of computing, components of the computer system and process of assembling a computer from scratch. We showed them videos on process of assembling & disassembling and also elaborated on the functions and importance of each part. Students were then taken into a lab and were provided with necessary components and tools for assembling a computer. All groups completed the tasks by assembling the computer and tested its working successfully. This activity was received by students with great excitement and energy as they got hands on experience on the the different hardware parts of a computer.

3) *Department of Electronics and Communication Engineering:* Students were briefed to make a simple home alarming system and were then expected to get an insight on the use of electronic equipments for real life purposes. They were first taken to a lab and were shown various electronic components and equipments such as resistor, capacitor, inductor, diode, transistor, printed circuit board, cathode ray oscilloscope, function generator, regulated power supply, voltmeter and ammeter. Demonstration was given on functions, working and uses of CRO, function Generator and regulated power supply. Students were then divided into groups and provided with a circuit diagram, circuit board and required components. All groups were shown how to solder the components on the circuit board. They were also taught working of the circuit and resistor color code calculation so that they would be able to identify the appropriate resistor required for the circuit. Students gave a good response after the activity as it was their first hand on experience in making a live project.

4) *Department of Electrical and Electronics Engineering:* The activity intended for students to design working models which work on the principles of electrical engineering. It was planned to help students identify electrical engineering principles which are regularly used in real life scenarios. They were asked to develop 2 working models as part of the activity. The first activity was to make a generator from motor for emergency lighting purposes. Students were expected to learn about circuits and conduction of electricity as a part of the activity. Each group initially observed how energy from generator can be used for home lighting. Then they built a small generator from motor wood pieces, rubber, motor, nut, bolt, pulley, and light emitting device. A light bulb was made as the second working model. This helped students understand about conduction of electricity, components of a light bulb and observe how energy from batteries can be used to produce light. Students made their own light bulb using an energy source and a filament at the end of the activity.

5) *Department of Mechanical Engineering:* The activity was conducted to help students understand how day to day activities are related with mechanical engineering by designing small moving objects which work on the principles

of pressure, wind energy, etc. Students were divided into 10 groups with a faculty and student advisor assigned to each team. Thermocol sheets, rubber bands, wood pieces, ball pins, gum, spokes, color paper, ice cream sticks, card boards, balloons, bottle caps and empty water bottles were the materials provided to them. Each group came up with many small working models which run using wind energy. Every group had a good interaction with fellow students and faculty in the process of completing the activity. Students exhibited a very positive response at the end of the activity as they were able to make small working models out of static materials and also learned to work in a team.

### III. FEEDBACK AND RESULTS

Feedback was taken in the form of survey from the students after the completion of the induction program. The feedback was intended to provide a measure of improvement in level of understanding and confidence of students on engineering education. Additional parameters were included in the feedback which provided the impact of each activity on the students and also the highlight the scope of improvement. An analysis was made after the collation of the results which is shown below.

#### A. Level of Understanding of Engineering Education

Fig. 1 and Fig. 2 illustrate student's level of understanding on engineering education before and after the induction program respectively. There has been a considerable improvement after attending the induction program as shown below.

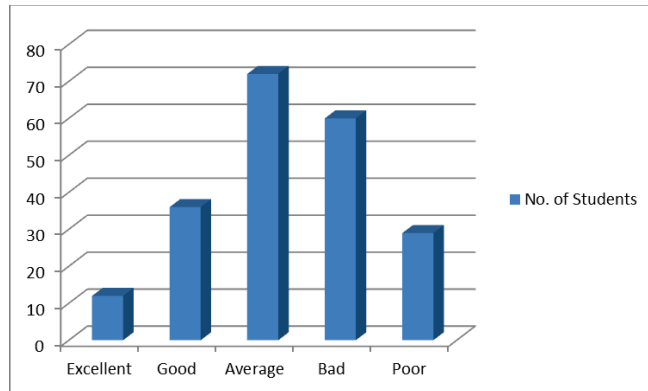


Fig. 1. Level of understanding before Induction

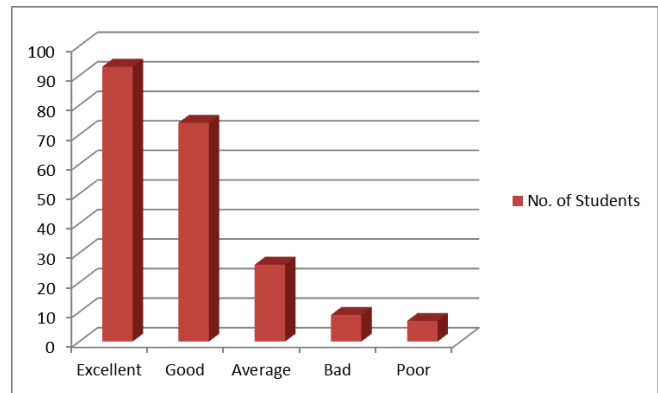


Fig. 2. Level of understanding after Induction.

#### B. Confidence Level

A comparison of Fig. 3 and Fig. 4 depicts the increase in their confidence level amidst the students after attending the induction program.

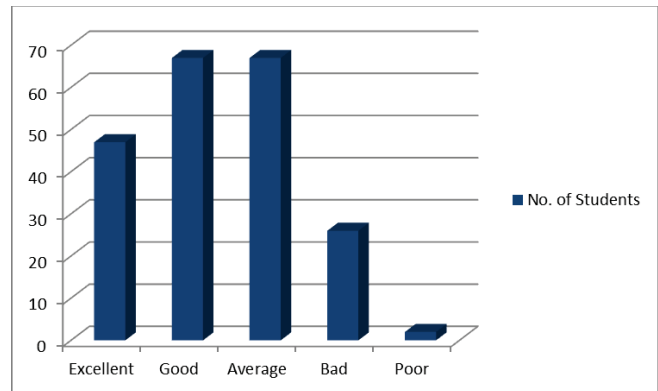


Fig. 3. Confidence level before Induction.

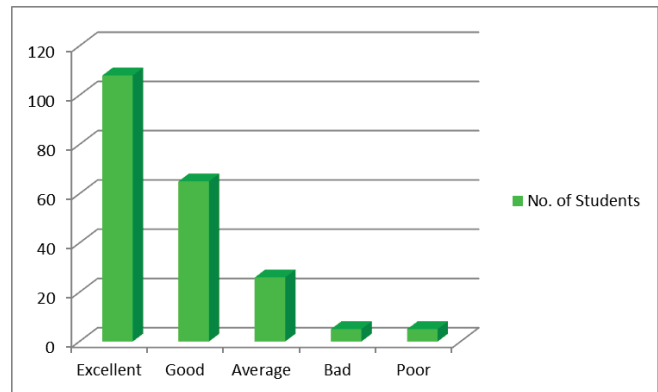


Fig. 4. Confidence level after Induction

### C. Ice Breaking and Department Activities

The ice breaking activities conducted on day 2 encouraged students to speak out with their peers and express their thoughts. Fig. 5 shows the response of students who rated the impact of ice breaking sessions on a scale of 1-5 (1 being the best). This is expected to help the students in future to interact easily and effectively with the faculty.

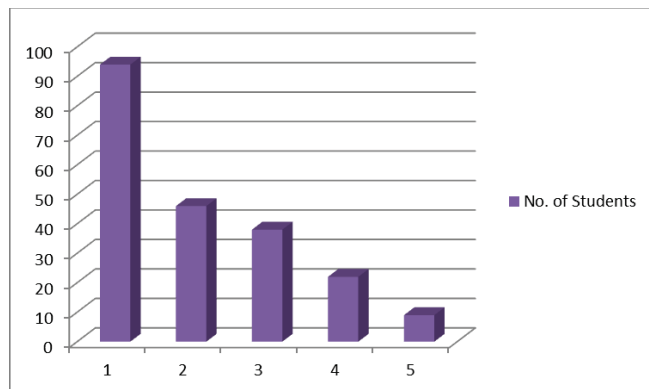


Fig. 5. Impact of Ice Breaking activities.

Fig. 6 illustrates the outcome of department activities which was conducted on day 3. The hands on experience helped students comprehend the role of engineer in daily life. Fig. 6 shows students response on how well the activity helped them get an overview on the role of an engineer on a scale of 1 -5 (1 being the best).

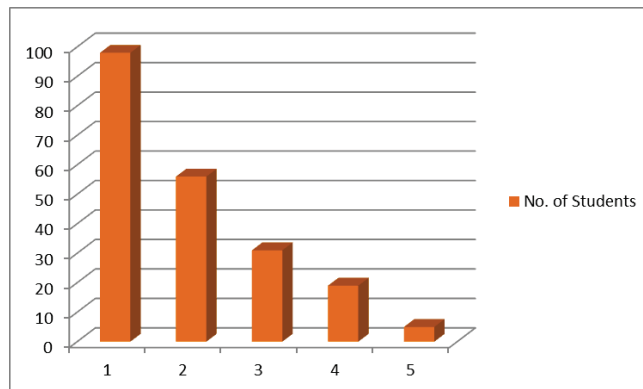


Fig. 6. Outcome of Department Activities.

### IV. FUTURE SCOPE OF WORK

Analysis will be done on the performance of students after completion of one year. This will be compared to the performance of the previous year after which modifications will be made to the next year's induction program in order to improve its effectiveness.

### REFERENCES

- [1] UGC (University Grants Commission). 2011. "Annual Report." UGC, New Delhi.
- [2] Aspiring Minds' National Employability Report – Engineering Graduates, 2012.
- [3] Patricio Poblete, Carlos Vignolo, Sergio Celis., William Young, Carlos Albornoz, "Assessing an Active Induction and Teaming up Program at the University Of Chile", NCHIA 10th Annual Meeting in Portland, Oregon, March 23-25, 2006.
- [4] Barker, P. and McLaren, A. (2005) Teaching First Year by Mechanical Dissection. The Higher Education Academy Engineering Subject Centre..
- [5] Harvey, L. and Drew, S. (2006) The first-year experience: a review of literature for the Higher Education Academy.