

Student Development through Comprehensive Training for Placement Improvement: A Quality Circle Approach

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Abstract— Contribution of Engineering Education to the sustainable development of the industry have shown its importance. In each phase of industry revolution, core engineering branches have played significant role by providing competent engineering graduates. Over the years' industry requirements are changed accordingly the employability skills of the graduates needs to be uphold. Further, the core engineering branches are facing challenges to adopt the revolution of allied engineering branches and courses. To address these issues, the students of core engineering branches to be trained in various dimensions for filling this gap. Thus, the paper discusses the development of students of core engineering through means of comprehensive training to make them employable with quality circle approach. The comprehensive training has been conducted for specific set of students of electrical engineering for placements in core companies with higher packages. Various surveys have been conducted to identify the skill-set requirements of students and expectations of industry.

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Accordingly, the comprehensive trainings were organized by considering the feedback from the

survey conducted. The outcome of the comprehensive training is found to be efficient in terms of placement opportunities and improvements in packages.

Keywords— *Student development; quality circle; employability; placement; comprehensive training*

I. INTRODUCTION

THE basic core engineering branch careers have seen decline in the placements in last few years. Also, students' interest and motivation towards core engineering career is less. However, there is another concern for placements in core industry is mainly due to the capability of students to reach the expectations of the industry requirements (Perova, T. V., & Kustov, T. V. (2015)). The holistic development of the students becomes an integral part of the teaching learning process of contemporary education (Srikanth et.al (2020), So et.al (2015)).

The government and employers are nowadays searching for graduates who have core and interpersonal skills so that they can corporate, communicate and solve problems (Bennett et.al (1999)). These skills and attitudes are essential in the graduates to solve the challenges of knowledge-based economy and globalization. As a reason the current education system seeks more attention towards the development of skills and knowledge that will enable the students to adopt the ever-transforming world market. The employees are nowadays searching for graduates who have technical as well as ethical and social

skills. To improve the creativity and positive attitude towards science, it is very crucial to motivate students to engage them in various activities related to science and technology (Lee, M. K., & Erdogan, I. (2007)). Thus, it is very important to provide training to the students not only based on the curriculum but also additional training based on the current industrial technical requirements. Moreover, it is also essential to improve the soft skill of the students to enhance the employability of the students. All these requirements could not be accomplished by the conventional curriculum and the normal teaching hours (Sandoval et.al (2018), Glass (2020), Metri et.al (2018)). Thus, the faculties of the technical institute need to take extra effort in uplifting the employability skills of the graduates. Keeping this in mind, the proposed work gives emphasis on student development to improve the core company placements at Department of Electrical Engineering, Rajarambapu Institute of Technology (RIT), Islampur, Maharashtra, India. The typical characteristics of this proposed work, emphasizes the career development of students through a comprehensive training which are essential for enhancing required skills for the graduates when they enter into the industry.

This paper discusses the steps taken by the faculty members of the electrical engineering department, RIT, Islampur for the overall development of the students through the quality circle methodology. The Quality Circle was introduced in the 1950s in Japan as an industry practice to utilize the potential of employees. The Quality Circle (QC) movement took the Japanese industry to a new high in the 1970s and onwards (Watson, G. (2004), Zetie, S. (2002), Pandey et. Al (2023)). A group of people working in an organization come together to find a solution to an identified problem at their workplace through discussions and analysis. It is observed that the QC activity enhances work culture and performance at the workplace. The idea of developing people evolved into the philosophy of the Quality Circle, where presentations are made to the management on a regular basis by the Quality Circle team and decisions are made regarding whether to accept, improve, or reject the proposal based on the presentation (Jayakumar & Krishnaraj, 2015).

The current socio-economic situation and pandemic in the last few years lead to the necessity of skill development among the graduating students. Student development has been taken-up as the problem for QC activity. Furthermore, we, QC team, decided to focus on

comprehensive training under student development, so that it would help them to fetch a core industry placement with a higher package. The proposed study endeavors to appreciate the importance of comprehensive training for electrical engineering students. Further it is found that, this approach echoes with the New Education Policy (NEP) structure where any graduate will acquire skills set required in the industry.

As a best practice, every year RIT conduct quality circle activity. Accordingly, the institute has decided the theme “student development” as a problem for quality circle activity 2022-23. This provides a great opportunity for QC team to engage the students to build and foster a meaningful student engagement experience towards employment. This will also motivate students to involve in various professional and technical development activities and strengthen their knowledge and have a great learning experience.

The paper is structured in following way: Section II introduces the methodology which covers problem identification, selection of problem, problem definition & analysis, identification of causes & root causes and data analysis. Section III gives solution for the identified problem. Section IV concludes the article.

II. METHODOLOGY

A. Problem Identification

Being a premier technical institution in rural area, many problems have faced where the improvements are required for the overall development of the students of the institute. The quality circle team has identified following problems through brainstorming as shown in Table I. Total 50 problems have been identified where electrical engineering students needs improvement by brainstorming among the QC Team. Out of the identified problems, one problem to be selected for final QC activity as represented in Section II.B.

B. Problem Selection

Once identified probable list of problems, the rating method tool and brainstorming is used to select the final problem. The problem selection was done in two phases, in phase 1 the quality circle team has conducted brainstorming among the team and selected 14 problems

TABLE I
PROBLEMS IDENTIFIED THROUGH BRAINSTORMING AT A GLANCE

Sr. No	Problems Identified
1	Programming skills.
2	Technical Event development
3	Formation of different club's
4	Extra-curricular activities for improvement of life and personal development of students
5	The technical paper writing skills of the students are weak.
6	College bus timing and tracking system
7	How to improve library hours of faculties
8	Poor response of students towards tutorials.
9	Active Learning Strategies.
10	Cooperative Group Assignments.
11	Teaching learning methodologies.
12	Improper assignments to students.
13	Unawareness about personality.
14	Training for staff for diff. software.
15	Career awareness among students.
16	Poor connectivity amongst the students.
17	Poor communication of students.
18	Training facility to new staff.
19	Hostel facility problem.
20	Student Placements.
21	Industry Institute Interaction.
22	Quality of student's projects.
23	Communication gap amongst the students.
24	Project work automation.
25	Attendance system for Mess.
26	Student attendance automation
27	Training to student on interview technique.
28	Training for non-technical staff in dept.
29	Implementation of 5S in electrical engineering department
30	Lack of research facility to staff.
31	Student's collaboration.
32	College bus timing and tracking system.
33	Use of graphical tools for assignments.
34	Programming skills.
35	Course attainment and analysis tool.
36	SMS facility in the department.
37	Professional etiquettes monitoring system
38	Poor response of students towards tutorials.
39	Poor attendance of students in classroom.
40	Translating learning research into practice.
41	Strategies for enhancing e-learning.
42	Software development for maintenance department.
43	Protecting institutional data.
44	Addressing emerging ethical challenges.
45	ICT tools in education.
46	Rewarding Learner Participation.
47	Active Learning Strategies.
48	Cooperative Group Assignments.
49	Teaching learning methodologies.
50	Improper assignments to students.

after redefining, as given in Table II. Out of the 14 problems listed we filtered which need more focus from student perspective and rated them on a scale of 5 per group member, after this the points were cumulated and the highest rated problem were finalized as shown in Table III.

In phase 2, the highest rated 6 problems were selected as shown in Table III and have again discussed in the QC meeting in presence of department faculty members and used rating method to find the final problem to be selected for quality circle activity 2022-23.

The problems presented in Table III are put in front of the Department faculty members to finalize one major problem to finalize for the QC 2022-23. According to the rating method as shown in Table IV, the problem, "Improvement in core company placements and package" has got highest rating and finalized the same for the QC 2022-23.

C. Problem Definition

As a part of QC activity 2022-23 the Quality Circle team of the electrical engineering have found the problem statement as "to serve the future needs and challenges of industries, it is very important to develop competent graduate". For achieving the same, knowledge, skills and attitude of students need to be enhanced to meet the industrial requirements. This work focusses on the overall development of the students through comprehensive training (CT) plan with the help of experienced professional by quality circle methodology mentioned in Fig.1.

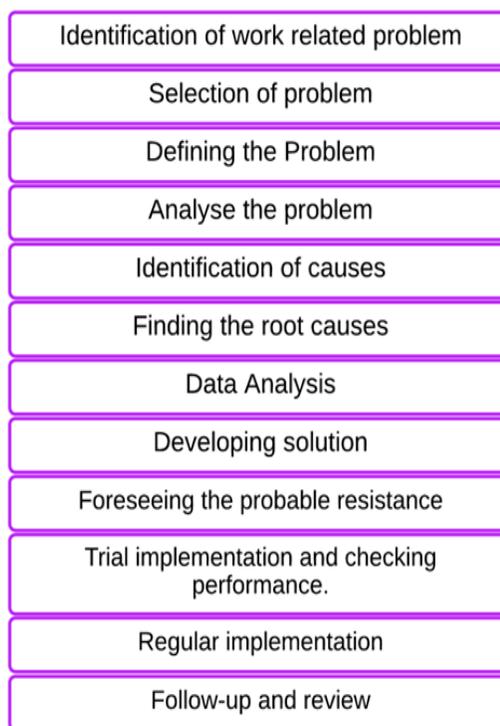


Fig. 1. Twelve Step Quality Circle Methodology.

D. Problem Analysis

As an academic organization, it is our primary responsibility to take a step towards the overall development of the students to make them industry ready graduate. There is a growing need to equip the graduate student's growth and success, not just with technical

TABLE II
PROBLEM SELECTED THROUGH RATING METHOD

Sl.No	Problems Identified	ASP	SA	VBP	RAM	SP	Total
1	Programming skills.	4	4	3	3	3	17
2	Technical Event development	3	5	3	3	3	17
3	Formation of different club's	4	4	3	4	3	18
4	Extra-curricular activities for improvement of life and personal development of students	3	3	4	5	4	19
5	The technical paper writing skills of the students are weak	3	4	3	3	3	16
6	College bus timing and tracking system.	3	4	5	5	5	22
7	How to improve library hours of faculties	5	3	4	4	4	20
8	Poor response of students towards tutorials.	5	4	4	5	4	22
9	Active Learning Strategies.	4	5	4	3	4	20
10	Cooperative Group Assignments.	3	3	3	4	3	16
11	Training for staff for diff. software	5	4	4	5	5	23
12	Hostel facility problem.	5	4	4	5	5	23
13	Quality of student's projects.	5	3	4	4	5	21
14	Improvement in core company placements and package	5	5	5	5	5	25

TABLE III
PROBLEM SELECTED THROUGH RATING METHOD: REDUCTION

Sr. No	Problems Identified	ASP	SA	VBP	RAM	SP	Total
1	Improvement in core company placements and package	5	5	5	5	5	25
2	Training for staff for diff. software	5	4	4	5	5	23
3	Hostel facility problem.	5	4	4	5	5	23
4	Active Learning Strategies.	3	4	5	5	5	22
5	Poor response of students towards tutorials.	5	4	4	5	4	22
6	Quality of student's projects.	5	3	4	4	5	21

*NOTE: In TABLE I & II, ASP; SA; VBP; RAM; SP: Faculty initials

TABLE IV
FINAL PROBLEM SELECTION USING RATING METHOD

Sr. No	Name of Faculty	Problem 1	Problem 2	Problem 3	Problem 4	Problem 5	Problem 6
1	Dr. V. N. Kalkhambkar	5	4	3	4	4	4
2	Dr. D. B. Talange	5	4	3	4	3	4
3	Dr. P.P. Gupta	4	4	2	5	4	3
4	Dr. Sujil A.	5	5	3	4	4	4
5	Dr. A. R. Thorat	4	4	3	4	3	4
6	Prof. Y. N. Bhosale	4	4	3	5	4	4
7	Prof. S. S. Kumbhar	5	3	2	4	3	3
8	Prof. K. M. Nathgosavi	4	4	3	4	4	4
9	Prof. R. A. Metri	5	3	2	4	3	3
10	Prof. C. L. Bhattar	4	4	3	3	4	4
11	Prof. A. S. Pandey	5	4	3	4	4	4
12	Prof. Vishal B. Patil	5	4	3	4	3	5
13	Prof. Sagar P. Burud	4	4	3	4	4	4
14	Prof. Omkar P. Swami	5	4	3	4	4	4
	Average Rating	4.54	3.92	2.79	4.07	3.62	3.85

knowledge but also to develop a holistic set of skills equipping them to face the real world as well as ever upgrading industrial needs. A lot of efforts have taken by the institute towards the direction of overall personality development of the students to make them industry ready graduates to serve the requirement of the industry and become capable of employment and self-employment.

To address the above problem and develop competent electrical engineers to serve the various industry needs, various aspects like improvement in soft skills, general aptitude, technical training through

MOOC, MATLAB have to be enhanced. The quality circle team try to identify the area of improvement required for the students to enhance the employability through comprehensive training (CT) plan. Thus, the objective of the quality circle 2022-23 of the QC team has set, "To prepare industry ready graduates through comprehensive training (CT)".

After many brainstorming sessions among the QC team members, it has been identified that various trainings have to be conducted for students for the overall development other than the contents taught in classroom

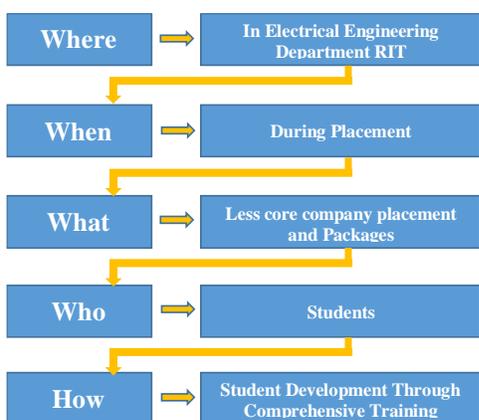


Fig. 2. Problem Analysis: 4W-1H principle.

according to the syllabus. By utilizing the method called 4W-1H principle as represented in the Fig. 2, a prominent solution to this, the QC team has decided to conduct comprehensive training for the overall development of the students. It incorporates various expert sessions, conduction of workshops on new and advanced tools and techniques, sessions on personality development and soft skills that help learners to better equip and become industry ready. On the basis of collected information and brainstorming, various causes have been identified and discussed as in Section II.E

E. Identification of Causes

The quality circle team has identified various causes related to less placement in core industries and enhancement in packages of the electrical engineering students through various brainstorming discussions and surveys. For identifying the area of improvements required, survey from students, alumni and industry persons were taken with the help of google form. Total 24, 15 and 142 responses have received from the industry persons, alumni and students respectively.

Total 35 areas of concern have been identified where the students of electrical engineering require improvements in various aspects as represented in Table V by brainstorming on the responses received from the industry persons, alumni and students respectively.

F. Finding Root Causes

Following causes have been identified and categorized into causes related to students, faculty and miscellaneous as represented in Table VI. The primary step in this process is started with preparing the rough list of the causes and classifying the same in different categories for the better logical findings, elaborations and findings as represented in Table VI. The main student

TABLE V
AREAS OF CONCERN FOR LESS PLACEMENT

Sr. No	Area of Improvement required in students
1	Project Management skills
2	Lack of Confidence while expressing
3	Language Proficiency
4	Distraction from social media
5	Lack of awareness about Career path
6	Lack of Discipline and manner
7	Approach towards Placement (Focus on package only not domain)
8	Lesser Industry interaction.
9	Lack of Persistence while doing Capstone project and time-consuming task
10	Multitasking
11	Rigid mindset towards learning new skills
12	Lack of support from faculty /peer group.
13	Out of date Curriculum
14	Impractical/ Unrealistic Evaluation system
15	Lack of lab exposure /research facilities
16	Not attentive to post lunch session.
17	Time For preparation for communication & aptitude.
18	Heavy burden of Assignment
19	Transition for online to offline
20	Homesickness
21	Excitement toward new area and change their career goal and major plans.
22	Maze of things to figure out
23	Vocabulary and rituals and that are new and unique
24	Lack of skill assessment test
25	Lack of group discussion
26	Lack of pre panel interview round
27	Lack of participation in tech fest
28	Lack of training for HR round
29	Lack of clarity of thought
30	Lack of interest in research
31	Lack of awareness of job opportunities
32	Lack of awareness of way of preparation for particular job
33	Lack of pre planning for placement
34	Lack of pre planning for GATE
35	Less attendance in Training Programs.

related causes are lack of motivation to learn the soft-skills required for placement activities, students are not

TABLE VI
CLASSIFICATION OF CAUSES

Student Related Causes	Faculty Related Causes	Miscellaneous Causes
Lack of motivation to learn the soft-skills required for placement activities.	Lack experience in training soft skills to students	Which type of training would be more suitable to make the graduates industry ready?
Students are not aware of industry requirements from engineering graduates	Limitations to update the curriculum and drafting the content	Lack of competent resources to conduct the training.
Students are focusing more on knowledge-based learning through course exams rather than skill and attitude-based learning	More comfortable in content delivery-based teaching learning process	If the facilities available are sufficient to conduct the training?
Lack of knowledge of core electrical design process	Limitations in using assessment tools and technique.	Schedule of training considering academic activities to avoid overlapping.

aware of industry requirements from engineering graduates, students are focusing more on knowledge-based learning through course exams rather than skill and attitude-based learning and lack of knowledge of core electrical design process.

The main faculty related causes are lack of experience in training soft skills to students, limitations to update the curriculum and drafting the content, more comfortable in content delivery-based teaching learning process and limitations in using assessment tools and technique. Along with the student and faculty related causes some miscellaneous causes are also identified. The miscellaneous causes are, which type of training would be more suitable to make the graduates industry ready, lack of competent resources to conduct the training, if the facilities available are sufficient to conduct the training and schedule of training considering academic activities to avoid overlapping.

Any complex problem can be tackled easily and effectively by understanding in-depth knowledge of reason leads to the problem. Thus, to understand the real reason, it is good idea to start with fishbone diagram as shown in Fig. 3, which is an effective Quality Circle tool used to logically elaborate the reasons that generate the problem.

In Fig. 3. the problem or effect is represented at the head or mouth of the fish. Probable sub causes or contributing causes are listed on the smaller “bones” under various cause categories like student related, faculty related and miscellaneous. A fishbone diagram can be supportive in recognizing imaginable causes for a problem that might not else be considered for guiding the team to see at the categories and think of alternative causes.

G. Root Cause Analysis

Root cause analysis is done based on the weightage point based method. There are three type of causes which are discussed in Table VI. Cause 1 is related to students, cause 2 is related to faculty and cause 3 is there as a miscellaneous cause. From weightage point based analysis of these three categories of causes is presented using bar chart as shown in Fig 4 to 6.

As a result of the root cause analysis conducted using the quality circle tools represented using fish bone diagram, gives the actual cause of students less core company placement and packages are the deficiency of comprehensive training in the various aspects of placement requirement.

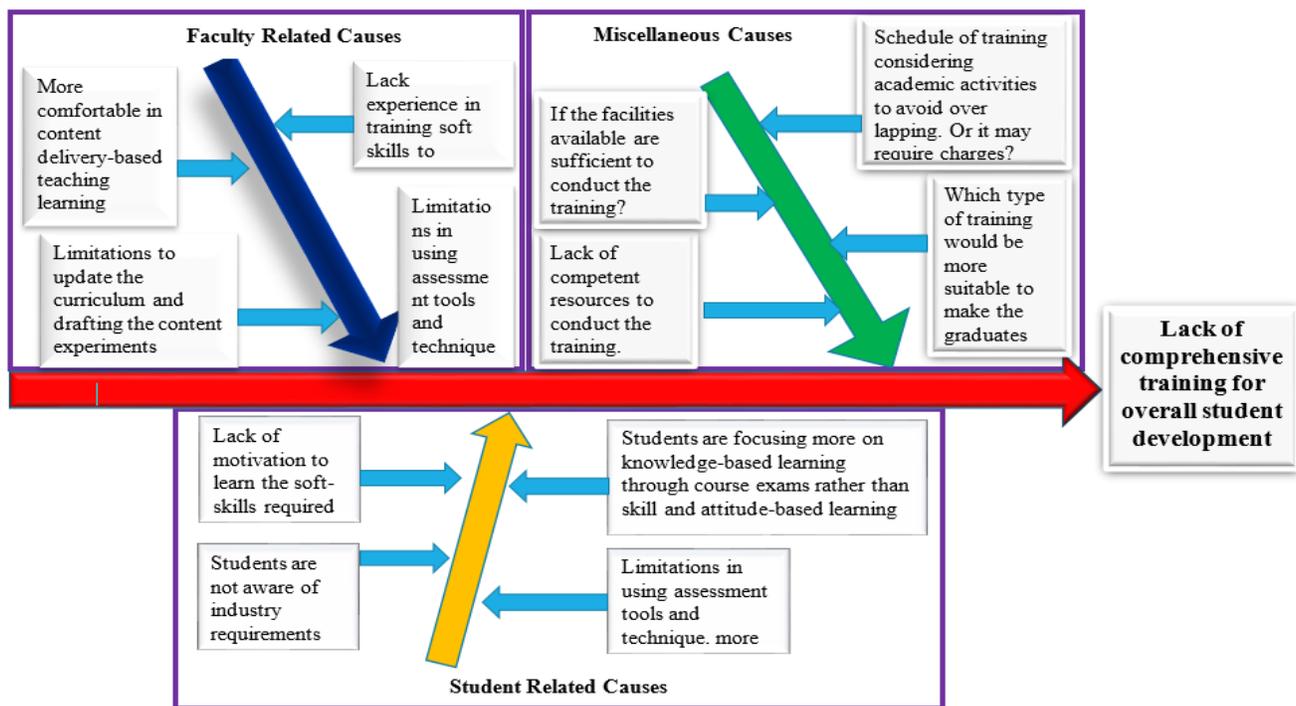


Fig. 3. Fish-bone diagram.

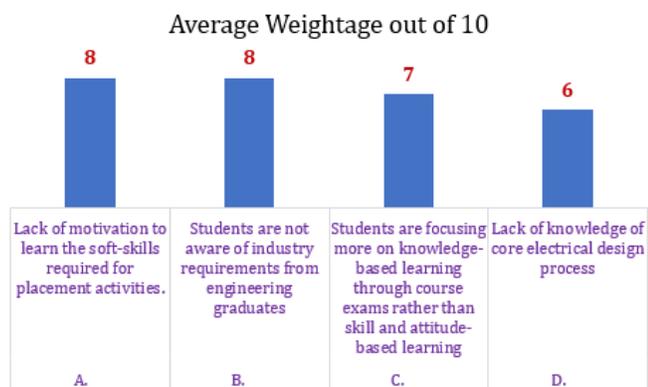


Fig. 4. Student related causes.

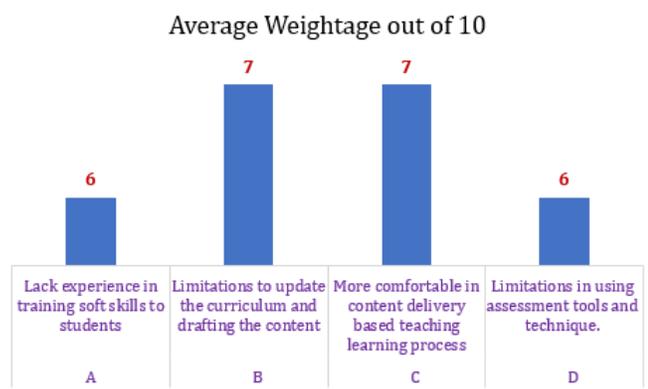


Fig. 5. Faculty related causes.

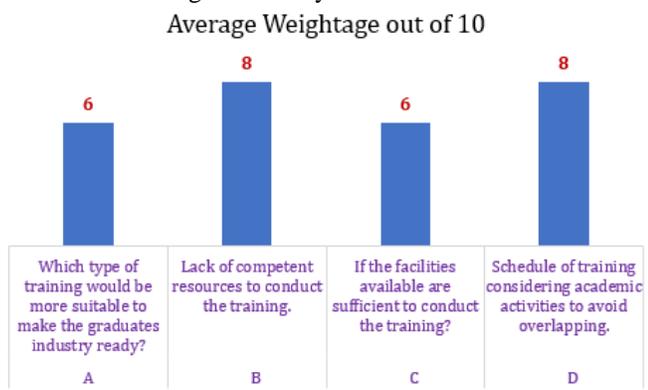


Fig. 6. Miscellaneous causes

H. Analysis of Data

With the collected and available data, analyzed sub causes, & root causes and the QC team have conducted a brainstorming session during the QC meeting and decided to conduct following training programs to avoid the limitation of faulty related causes, student related causes and miscellaneous causes.

1. Conduct soft skill training program.
2. Conduct Corporate Competence training program
3. Conduct One Month Electrical Design & Drafting Training program

4. Conduct One Day Workshop on MATLAB Programming and Simulink
5. Conduct two-day workshop on technical report writing

Moreover, it has been decided in meeting to motivate the students to participate in various training programs organized and conducted in other institutes.

III. DEVELOPMENT OF SOLUTION

The QC Team has brainstormed about the problem analysis and came out with solutions like organizing and conducting the technical and soft skill related training programs and sessions, so that it will be helpful for them during placement activities.

A. Foreseeing the Probable Resistance

The implementation of solutions i.e., organizing the training programs and activities during busy academic schedule was the major hurdle, which was the probable resistance. So, only the chance is to conduct workshops or trainings on non-academic days and off-academic hours, where ensuring the students' participation is also a great challenge.

B. Implementation of Solution

As discussed earlier, following actions have been implemented as a prominent solution to the less core company placement and higher packages.

Action 1: Soft Skill Training Program

Soft skills training program was intended to improve decision making, build positive attitude, enhance time management, ability to work under pressure, boost creativity and problem-solving skills. The student response was very good for the training program.

Action 2: Corporate Competence training program

The objective behind keeping this training program was to prepare the students for the interview and group discussion rounds of core industries. Also, it included the resume building, soft skills and personal interview sessions.

Action 3: One Month Electrical Design & Drafting Training program

This training program was unique considering it was related to electrical design and drafting, which now-a-days is very crucial in the market. Students learned about AutoCAD electrical software and were able to design the given problems on the above-mentioned software. It was a month-long duration activity and



Fig. 7. Snaps from different Actions taken.

students have experienced joy of learning.

Action 4: One Day Workshop on MATLAB Programming and Simulink

The team furthermore worked and planned the workshop on widely used core industry software – MATLAB. The objectives of this program were to impart knowledge of programming and simulations in the above said software. To facilitate them, real-time hands-on sessions were kept and tasks are given.

Action 5: Two-Day Workshop on Technical Report Writing

In any industry, communication skills – written or verbal, are very important. To provide an exposure to students, a technical report writing with LaTeX was conducted, so that they can document their project reports with better quality.

Action 6: Motivating students to participate in various training programs in other institutes

The QC Team also motivated students to participate in various training programs organized by various institutes or organizations.

Actions 1-6 were conducted as represented in the Fig. 7 exclusively for all eligible Third-year electrical graduates of RIT.

C. Follow-up and Review

After implementation of solution, the Quality Circle Team has achieved the results in terms of placement of Third-year B.Tech electrical engineering students in core company with a package of Rs.6.50Lac per annum, which is happening first time in electrical department. Fig. 8 shows the feedback received from the placed students regarding the quality circle team activities conducted.

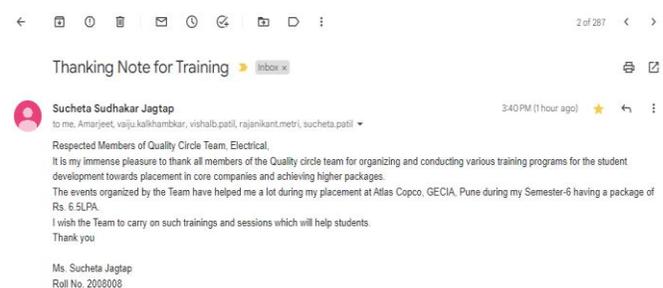


Fig. 8. Feedback received from student.

The students have appreciated the initiative of Quality circle team for organizing and conducting various training programs for the student development towards placement in core companies to achieve higher packages. Some students have also recommended to continue these

activities in future so as to benefit their batchmates and juniors.

It is also evident from the attendance of the events organized that all the placed students were attended all the events organized by QC Team for this purpose and hence it can be concluded that the purpose of QC team towards the Student Development for core company placements with higher packages was a successful mission.

IV. CONCLUSION

The development of students in any institution is vital for placement point of view. The proposed paper discussed about the enhancing employability skill development of the students through comprehensive training with the help of quality circle methodology. The Quality Circle Team has successfully completed the Quality Circle Activity 2022-23 by providing the solution to the problem which was identified. As a result, the placement of students in core company with higher package has been achieved. The reflection of QC activity will be greatly found in upcoming placement drives and we expect more packages and more core company placements during their Final Year placement drives. The result can be seen in terms of increase in number of eligible students for upcoming placement opportunity in core engineering.

Organizing and implementing comprehensive training to make the students industry ready is a key paradigm in the student development process.

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