IMPROVING PERFORMANCE OF RURAL ENGINEERING STUDENTS USING EFFECTIVE IMPLEMENTATION OF WELL-PLANNED ACTIVITIES

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Abstract

To improve the performance of engineering students is always a challenging task in front of educationalists, faculty, and institute management. The problem becomes more important and challenging for the institutes located in rural areas. To enhance learning activities, in addition to classroom teaching, and motivating students, and faculty, well-planned activities and their proper implementation play a very vital role. This paper deals with action research on enhancing the academic performances of students through various activities such as Induction programs, attendance, a mentor system, unit tests, efforts for weak and bright students, use of technology, best class award, and appreciation of students. Starting with the literature review, we presented our experiment on these activities. It has been shown that students' performance can be improved through proper planning and implementation. We used various methods, strategies, surveys, student feedback, and university results for this purpose.

Keywords:
Engineering Education, First Year Engineering, Rural Students, Induction Program, Mentorship

1. INTRODUCTION

The development of a country depends on many factors and the education system is one of them. An efficient and suitable education system always helps for growth and development. The education system consists of many factors such as students, teachers, institutes, parents, society, Government, etc., but students are at the center. Hence to improve the quality of the education system there is a need to carefully see the problems of students and solve them on the highest priority.

In India, engineering education is the major component of the development of the education system. Many students are taking admission to engineering courses and are willing to complete the graduation. But, unfortunately, some of them are not able to complete their degree in the stipulated period. Moreover, among the successful students, many are not employable due to a lack of job skills as per the industry's needs. But the root cause of the problem starts at the entry-level. Many engineering students are failing in the first year of their studies. There is always a concern about the problem that why students are not taking interest in learning. And there is a need to improve the quality of the education system in the following aspects: Teaching methodologies, learning techniques, support systems, evaluation systems, etc.

1.1 LITERATURE REVIEW

It has been observed that students are facing many problems, which affects their performance, some of them are problems at the entry-level [25] [10], subject-related problems [30], Teaching Learning (TL) pedagogy, [31], active learning, web-based teaching-learning [9] [16] [19]. Also, there are many issues in rural education, [24], such as internet facility, bandwidth, getting experienced, qualified, and quality teachers who are attracted to the urban areas. On the other hand, students face many problems related to awareness and access to the internet, and lack of efficient use of technology for study. Also, due to low income, less awareness, and other problems, parents are not able to provide suitable technology, computers, and mobile phones to their wards at the right time.

1.2 RESEARCH GAP

Thus, to satisfy the requirements of society and industry there is a need to study students' problems starting from their entry-level and solve them. Particularly in institutes that are in rural areas, where the problem becomes more important since students need more support. Moreover, if the student performs better in academic activities in the first year, then it helps them to perform better in the next years and acquire the required technical skills. Managing various activities, proper time management, convincing students, and getting expected output is a big challenge in front of educationalists and institute management located in rural areas. Thus, in this paper, we are presenting one of our attempts in this direction. In view of getting better performance, creating awareness, and improving students' involvement in the teaching-learning activities, we presented our experiment on various activities that we planned and implemented for students in the first year of engineering (at entry-level).

Thus, the purpose of this paper is included in the following section.

2. RESEARCH QUESTIONS

- Is it possible to help first-year engineering students to adjust to the new environment of the institute?
- Is it possible to create awareness for better performance among students?
- Is it possible to improve the students' involvement in learning activities?
- Is it possible to improve the academic performance of students through various activities?

Starting with a review of the work, we are presenting our experimentation with various activities including the Induction program, Best class award, Mentor system, Unit tests, Attendance, etc. Further, we have shown that our method has a positive impact on improving results.

3. METHOD

In this study students of first-year engineering for the year, 2019-20 were considered. We considered this study at various stages, such as at the beginning of the semester, at the mid-

semester, and after the university examinations. Starting with a literature review, we presented our action plan which was adopted by us, our practices, and its effectiveness. We used various observations, student feedback, and oral interactions, we also used the result analysis of university examinations for the conclusions.

4. EXPERIMENTATION

Here we are presenting our experimentation through various activities. At the beginning of the year, we planned many activities with a specific purpose, some of which are included in the following:

Table.1. Activity Plan

Activity	Purpose
Induction Program	To make students comfortable with the environment of the institute.
Attendance	Inculcate the habit of regularity by their presence and active participation in all academic activities.
Mentor meetings	To help every student individually to make them comfortable and provide local guardians to support them.
Best class award	To develop a team culture and encourage them for improving their individual performance.
Appreciations	To motivate every student in all possible ways for their achievements.
Use of technology	To create awareness among the students about adopting new technologies useful for learning.

4.1 MENTOR SYSTEM

Mentoring is a complex, interpersonal relationship in which a mentee seeks guidance, knowledge, motivation, support, and encouragement from a mentor. Many researchers studied the impact of mentoring on students' performance and show that it has a positive effect on students learning and overall performance, [3] [8] [15] [18] [23] [29] [32] - [36].

In our institute faculty were given various responsibilities such as Head of the department, Coordinators, Class teachers, Subject Coordinators, Subject teachers, Mentors. Also, we use to involved Supporting and technical staff, and Office staff as per the requirements. After the first-year admission process, students were distributed in a batch of around 20. For every batch, one faculty mentor was assigned to that batch from teachers who were taking their theories or practical's. These mentors act as a local guardian, and for all problems that students were facing, it is expected that they should contact their mentors first. It helped to adjust to the environment of the institute, and finally, it helped students in improving their academic performance. In the timetable, we had included a separate slot for a mentor meeting one turn per week during the first month, and thereafter, it was twice a month or as per the requirements. In those slots, the concerned mentor, HoD, and class teacher of that division conducts a meeting where students can put their problems and suggestions for the betterment of the overall system. The Mentor

system helps to bridge the gap between students and teachers. The mentor guides the students in adjusting to the environment of the institute, goal setting, and their future guidance and motivations.

4.2 INDUCTION PROGRAM

When new students enter an institution, they come with diverse thoughts, backgrounds, and preparations. It is important to help them to adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose, [25] [10].

AICTE has proposed an induction program for the UG students entering the institution right at the beginning of the semester. The purpose is to make students feel comfortable with their new environment, open them up, set a healthy daily routine, create bonding with batchmates as well as between faculty and students, and develop awareness, sensitivity, and understanding of the self, people around them, society at large, and nature. In our institute as per guidelines by AICTE and SPPU Pune, two weeks Induction Program for the FE admitted students was conducted from 9 to 20 August 2019. The activities conducted include 14 modules which are: Physical Activity, Meditation Technique, Yoga, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to Local Area, Familiarization to Dept./Branch, HoD presentations, Awareness sessions about online platforms and Road Safety. Also, sports sessions took place in evening sessions, wherein all the newly admitted students were accompanied by the staff and the senior students. All newly admitted students with their parents were formally welcomed by the institute. The newly admitted students were made aware of their respective roll number, class, batch, and concerned teachers through student-teachers interaction sessions. The mentors were assigned to every batch of 21 students who were introduced. Later, the various subject toppers and overall toppers in the First Year Sem-II of (2018-19) University exam were felicitated by Hon. Principal. toppers shared their experiences. HoD FE introduced the engineering course structure, regular academic activities, information and importance of the induction program, overview of subjects, syllabus, the importance of attendance, unit tests, Google classroom, internal examinations, the pattern of university examinations, effective use of technology, and mentor system. The program was followed by overall guidance by the principal. In the afternoon session, the students visited their respective departments and HoDs' Presentations took place. Departmental HoDs focus on their departmental vision, mission, highlights, and achievements. In these sessions, HoDs showed some innovative models developed by the students and gave detailed ideas about future opportunities. There was a discussion on the importance of programming languages, future opportunities in software as well as hardware industries, and about the current scenario of industries' forthcoming developments and future opportunities.

A Road Safety Training session was conducted, and the speaker focused on the awareness of the traffic rules with the help of some videos. The importance of meditation was elaborated with the help of demonstration. Also, the Creative Arts activity, drawing, sketching, and mask-making sessions were conducted, and students enjoyed all these activities. Expert talk on "Importance of Sports in our Life" was arranged during the program. A session on the importance of anti-ragging by the

college committee took place. The faculty coordinators urged students for the necessity of discipline and good behavior during their undergraduate tenure.

We also conducted a session on Creative Arts, Origami, and Best out of Waste. The speaker demonstrated how to make purses, bags, and caps using newspapers. Students took a keen interest in this activity, and they also did nice things. A very interesting session on Creative Arts: Music: Basic to Apex took place, also, the speaker shared the history of music. During the session, the speaker asked some questions relating to music and musical instruments, and students answering correctly were encouraged by giving carburizes. We arranged a set of many musical instruments for the awareness of the students It was a distinct experience to be part of the session. Another session was conducted by HoD which includes the history, academic record, discipline, and regency of the institute. A detailed idea about the curriculum was also introduced and the basics required for it. Training programs each of four full days in two groups on (i) Soft Skills and (ii) Aptitude Training were scheduled. During the entire activity teachers, mentors, students came very close, and newly entered students felt comfortable and which was very important for them to adjust to the new environment. We arranged a visit to the society gymnasium, museum, and the various indoor courts of table tennis, badminton, and wrestling. Sports teachers gave guidance relating to the sports facilities that are available in society. Finally, students submitted a report of the program which includes their experiences during this program. A total of 240 students participated in this program. Faculty and student volunteers from across programs worked extensively to ensure that the induction was well organized. This program helped students to adjust to the new environment of the institute.

4.3 BEST CLASS AWARD

The objective of this activity is to give a chance to everyone for improve performance. Opportunity for exploring the talent of each student. Contribute individually to the entire class and to become the best learner. To build a team culture to make them confident, and competent for handling new challenges through group culture. To make parents, teachers, and society happy with their performance. The award was based on the overall performance of the whole class, which includes: Attendance: (average attendance of class at different stages), Online examinations performance, Internal tests (Theory, MCQ, Prelim Exam), Sem-I results, NPTEL Examination registrations, Discipline (Uniform, Reporting to college, behavior and other), Prize won (National, State level, University level or college level), Participation in sports, In addition, some more points were added to it. At regular intervals, scores of each class were displayed to know their status and to encourage them to further improvements.

4.4 ATTENDANCE

The quality of the education system is depending on many factors it such as overall management, university support, education policies, Government support, the environment of the institute, quality teachers, quality of students, infrastructure, and proper implementation of policies. To improve the overall quality of the education system students' response to planned activities is very important. One of the major components of improving

quality is the attendance of students for lectures and practicals. It has been observed that students are not actively involved or very less active during the learning activities, not attending classes regularly. The root cause of it is the student's attendance. Many institutes and teachers are facing the problem of less attendance. It is always challenging for teachers to apply suitable and effective strategies so that students will come to classes. Observations on the students reporting daily plays an important role in this regard.

Many researchers showed that class attendance correlated strongly with students' performance and had a significant effect on examination scores, for various subjects; [1], Organic Chemistry II, [5], Agricultural Economics [7], Mathematical courses [14], introductory science courses [11], Agricultural Science [2], medical [12], Economic [22] and Engineering. In view of many educators that class attendance enhances student academic performance [4] [6] [13] [14] [17] [20] [21] [26] - [28].

We have adopted a system in which recording attendance from the first day including all sessions (lecture and practicals) of every day. Once they know that their attendance is counted at each session, then it may help them to prepare their mind for attending all sessions regularly. Class-wise and students wise review of attendance of every lecture and practicals give overall responses of students for the academic activity. It helped to decide action plans for absent students, giving information and encouragement to absent for attending classes regularly.

Attendance monitoring system: After the start of the semester immediately after lectures and practicals faculty use to enter attendance on ERP. Based on ERP attendance weekly, and monthly monitoring was possible. Students with less attendance can be treated separately and it will help students to improve their attendance. At the end of the semester, student-wise overall attendance was displayed for the further process.

By looking at problems of absent students: Some students may be with special reasons like not well admitted to the hospital, family problems and maybe any other reasons. By considering reasons and reliability every student needs to be treated separately. In some cases, it can be asked to the problems through parents' interactions.

Display of detention list of students: Students whose attendance is below the required attendance need special treatment. Display of weakly/monthly detention lists is one of the best methods for it.

4.5 UNIT TESTS

Bloom's taxonomy focuses on six levels: remember, understand, apply, analyze, evaluate, and create. For any subject fundamental knowledge, understanding, self-study, and practice, are essential for the success in a learning activity. For achieving the best possible outcome, institutes are adopting the OBE system which ensures that learners would achieve predefined outcomes for the program in which they are enrolled. It requires organizing the curriculum, instruction, and assessment.

To test all these components the most frequently used tool is examinations. For conducting unit tests students must be aware of it, they must be informed well in advance about the unit test, topic, pattern of examination, duration, date, and time. For that timetable must be displayed well in advance so that students may get

enough time for their preparation. In our institute, we prepare an academic calendar for the semester, which includes all activities of the semester including unit tests. It requires awareness about the unit test, display of timetable of unit tests, effective conductions of unit tests, display of marks on notice board, display of names of toppers, showing answer sheets to students and further guidance for improvements, special Guidance to weak students, bright students, subject wise in class, a meeting of such students, appreciations of students, and motivations through various ways. We followed all the practices for the batch 2019-20 of FE. We conducted unit test-I, on the first two units, unit test-II on the next two units, and a preliminary examination on all units.

We have adopted an outcome-based education system, also continuous assessment in various ways. We have inculcated Bloom's taxonomy for teaching-learning and evaluation processes to achieve predefined and higher-level outcomes for the program. To ensure this, a well-defined policy for assessment is followed. Two internal examinations, Mid-Sem Test and End-Sem Test are conducted twice a semester. Question papers for internal examinations are prepared by considering Course outcomes and Bloom's taxonomy. Each course faculty prepares two sets of question papers. Question papers are evaluated by peer reviewers of the specialization group or program assessment committee (PAC). The scheme of evaluation for the question paper is prepared by the course faculty ensuring the appropriate distribution of marks for a fair evaluation. After the assessment of the answer sheets, the course faculty shows answer books to the respective students and finally gives oral feedback to the students. Immediately after the declaration of the results of these tests, corrective actions are taken for further improvements. In addition, the concept, tests, practice tests, and mock- quizzes are conducted by respective teachers as per the requirements to provide a platform for interaction among students.

4.6 EFFORTS FOR WEAK AND BRIGHT STUDENTS

Weak and bright students are identified based on using some of the following components which include previous academic performances, performance in the University examinations of previous years, results in basic tests, internal examinations, and teachers' observations.

Bright students are appreciated and encouraged for achieving higher goals. The weak students are monitored and provided with special guidance for better performance. We have University examinations as per the guidelines and timetable by Savitaribai Phule Pune University. There are Mid-Sem., End Sem. examinations for all students.

We encourage them to perform better in university examinations, and competitive examinations like GATE, GRE, etc. They are motivated to enroll in self-learning MOOC courses like NPTEL, Edx, Coursera, etc. Based on their liking our faculty members encourage the students, those who are having an orientation towards research are encouraged and guided for doing research work possible participation in conferences and various competitions. Bright students are encouraged to lead the students' association team which organizes various activities viz. paper presentation, poster presentation etc. We used to appreciate those who performed better in various activities.

Identified slow learners/ weak students are supported by taking extra efforts in academic activities by giving special time for solving their problems. Required support is provided to them through additional input by conducting extra classes. During informal discussions, faculty members discuss the issues related to their academic performance with weak students. In addition to the regular schedule, remedial classes and laboratory sessions are conducted for weak students. Additional support is provided through encouragement to involve them more in the learning process. We have an effective Mentor system, and mentors and class teachers help students with their moral building through counseling. We have a special counselor for solving the psychological problems of the students.

4.7 USE OF LEARNING MANAGEMENT SYSTEM

We have used Google classroom for enhancing learning. We formed a subject-wise Google classroom that was used for managing our system in online mode including uploading study material. Every faculty has YouTube channels and we prepared more than 450 video lectures and provided them to students. We formed Email groups of students which include class-wise, batch-wise, year-wise, student groups as well as department-wise faculty groups for better communication. In addition to this, we had class-wise WhatsApp groups. All information was communicated to students using these social media.

5. STATISTICAL ANALYSIS AND CONCLUSIONS

After implementing all activities, during the semester we appreciated students for their best performances in attendance, best class, unit test results, university results, NPTEL examinations discipline, etc.

Table.2. Appreciation for best attendance (Sem-I, 2019)

Month	Attendance %	Total Students Appreciated	Percentage
Sept.	100	155	39.34
Oct.	95 and above	80	20.30
Nov.	90 and above	106	26.90
Dec.	80 and above	265	67.25

Through best class activity as per the section, 4.5 at various stages marks were displayed and students were appreciated, and it was a good competition and every student of the class tried to contribute to their class.

Table.3. Appreciation of class through Best Class

Stage	% Marks Obtained					
	FE-I	FE-II	FE-III	FE-IV	FE-V	FE-VI
I	70	55	65	60	57	62
II	75	62	73	71	63	70
III	77	67	80	75	70	72
Overall Rank	II	VI	I	III	V	IV

The Table.3 shows that during various stages there was very good competition in each class for the best possible improvements. Also, based on the final examination of university results, we observed that there is an improvement in many aspects. Details of the result analysis are shown in the Table.3.

Table.3. Result Analysis (Percentage results)

Year / Class Obtained	2019-20	2018-19	2017-18
Pass	44.68	32.96	36.94
ATKT	44.68	35.21	40.37
Pass + ATKT	89.36	68.17	77.31
Distinction	24.20	18.59	17.68
First Class	16.22	10.14	15.83
Higher Second Class	2.93	2.54	1.85
Second Class	1.33	1.69	1.58

From the above table, there is an increase in the result of Pass + ATKT by 12.19 % as compared to 2018-19 and by 12.05 % as compared with 2017-18. Also, there is an improvement in the quality result, as it increased by 11.69 % as compared to 2018-19 and by 6.91 % as compared to 2017-18 (see Table.1).

Students' opinions on the implementation of activities and their usefulness for a better result as shown in the following table.

Table.5. Students Feedback (Sample size: 226)

Item	Students Response				
	100% Agree	80% Agree	60% Agree	40% Agree	Not Agree
Unit Tests	51.8	33.2	7.5	3.1	4.4
Attendance	51.3	29.6	10.2	4.9	4
Best Class	51.3	27.9	10.2	6.6	4
Checking Journals on time	51.3	28.8	11.5	9.0	9.0
Video lectures	40.3	36.3	14.2	5.8	3.5
Overall (Avg.)	48.7	31.8	10.5	5.1	3.97

From the above table, 96 % of students agreed that our activities were useful, and helped them with better results. In addition to the above activities mentioned in Table.5, from students' feedback, the following activities also helped them to improve their results.

- Support from the teachers: 97%
- Providing notes: 81.4%
- Providing question banks: 70.8%
- Providing question paper analysis: 52.2%
- Good coordination among faculties: 60.6%
- Extra Lectures: 40.4%
- Timely completion of the syllabus: 59.3%
- Mentor meetings: 33.2%

Through this experiment the following conclusions are incorporated.

6. CONCLUDING REMARKS

From various surveys section-V, Table.II to V shows that our activities attracted the students. Supporting students at the right time, particularly at the entry-level through an induction program, the mentor system helps them to adjust to the environment of the institute. Our planned academic activities including appreciation motivate them for their overall involvement in learning. All these activities had a positive impact on their overall improvements and academic performance.

7. LIMITATIONS AND FUTURE SCOPE

In this study, we obtained conclusions from our action research based on a group of students at the college level. It is possible to extend this study by considering more institutes and considering other factors which are not considered in this paper. This experiment also can be done for different disciplines and to any other undergraduate classes.

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