

Quality Circle Best Practices Activity

Academic Year (2019-20)

Automobile Engineering Department

“Load of multiple ISEs on students”

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“Load of multiple ISEs on students”

1. Introduction:-

Quality circle is intended to identifying the likely causes of well and critically observed problems thoroughly. Their major benefit of this is to consider all possible causes of the problem, rather than just the ones that are more obvious. This approach combines brainstorming with use of a type of a concept map.

2. Problem Identification:

In regular meetings of quality circle group, problems identified through brainstorming sessions (with teaching and non- teaching faculties, alumni, industry persons and students) in the Automobile Engineering Department during last academic year are listed here.

Table 1. Problems identified during QC meetings

Problem No.	Problem Statements
1	Lack of Core Company towards placement at AED
2	Less number of MOUs
3	Lack of faculty’s interaction with automotive industries.
4	Less IRG generation
5	Interaction of the department and training and placement office with industries
6	Aptitude and communication skills of the Automobile Engineering students are weak.
7	Department lacks of industry sponsored laboratory in the department.
8	Computer literacy of some non-teaching staff is weak.
9	5S implementation in Auto-Care
10	Development of methodology of any one single course using PBL
11	Enhancement of leadership, management, inter-personal skills among department students.
12	Design and development of Central Database Management System (CDMS) for Automobile Engineering Department.
13	Co-ordination between different portfolios (e.g. TPO, III Officer, and Alumni in-charge and department faculties) is less.
14	Promotion of use of reference books.
15	Lack of awareness about latest trends in automobile engineering among AED students.
16	Less H-index publications by faculty
17	Lack of advanced labs of automotive applications like electric hybrid drives, autonomous
18	Lack of licensed software’s related to automobile engineering
19	Lack of sponsored funding for student competitions’ like Baja, SUPRA, QBDC etc.
20	Lack of research resources for student competitions’ like Baja, SUPRA, QBDC etc.

21	Lack of students interest towards subjects like Insurance, Dealership etc
22	Lack of project management skills into students of AED.
23	Lack of cool and ventilated infra for software labs.
24	Inadequate space for project laboratory.
25	Lack of well-organized structure for all laboratories.
26	Shortfall in commercialization of patents.
27	Lack of awareness about AED in the Multi – National Automotive Engineering Industries.
28	Lack of email etiquettes among students and faculty members at AED.
29	Industry sponsored projects for B. Tech students are less.
30	Some of the students from B. Tech class are having poor attendance.
31	Implementation of PBL to enhance course deliverables and improve understanding among students.
32	Instruments from Automobile body engineering lab are not modernized.
33	Average and below average merit, students are getting admitted in the AED.
34	Lack high merit students admitted in AED
35	More number of students are failed to achieve throughout first class.
36	Lack of research facility to staff.
37	Faculty overloaded with non-teaching tasks.
38	Automated Student's Leave management.
39	Fewer activities in department for students.
40	Performance of Auto. Engg. Students in placement interviews is weak
41	Poor attendance of students in classroom.
42	Programming skills of students are weak.
43	Less no. of students opting Minor and Honor courses
44	Lack of industry sponsored lab
45	Load of Multiple ISE's on students
46	Lack of students interest towards ED and URE track
47	Insufficient funding for motorsport activity
48	Less interest of female students towards automobile engineering program
49	Students ignorance towards job opportunities of service sector and insurance sector
50	Lack of advanced automotive laboratory equipment's
51	Intentional Groupism in students
52	Poor self-study skills of student's.
53	Deficiency of Individual Research Publications
54	Less admission to the M. Tech. Automobile Program

Out of which, major governing four are formulated as:

1. Less no. of students opting Minor and Honor courses
2. Less H-index publications by faculty.
3. Insufficient funding for motorsport activity.

4. Load of Multiple ISEs on students.

3. Selection of problem:

After the substantial discussion on above major problems of the department, circulated Google form to Quality Circle team member for selecting the problem. We received high priority to the problem “*Load of Multiple ISEs on students*”. So “*Load of Multiple ISEs on students*”. Problem is selected. Screenshot of the rating to the problem selection is attached herewith.

	A	B	C	D	E	F
1	Name	Question [Preference 1]	Question [Preference 2]	Question [Preference 3]	Question [Preference 4]	Question [Preference 5]
2	SSM	Load of Multiple ISE's on students	Less no. of students opting Minor and Honor courses	Lack of awareness about AED in the Multi – National Automotive Engineering Industries.	Lack of awareness about latest trends in automobile engineering among AED students.	Shortfall in commercialization of patents.
3	SGK	Load of Multiple ISE's on students	Insufficient funding for motorsport activity	Less H-index publications by faculty	Lack of faculty's interaction with automotive industries.	Lack of industry sponsored lab
4	ATS	Load of Multiple ISE's on students	Less no. of students opting Minor and Honor courses	Lack of sponsored funding for student competitions' like Baja, SUPRA, QBDC etc.	Programming skills of students are weak.	Lack high merit students admitted in AED
5	RMS	Load of Multiple ISE's on students	Less interest of female students towards automobile engineering program	Students ignorance towards job opportunities of service sector and insurance sector	Insufficient funding for motorsport activity	Students ignorance towards job opportunities of service sector and insurance sector
6	SBD	Load of Multiple ISE's on students	Less H-index publications by faculty	Aptitude and communication skills of the Automobile Engineering students are weak.	Lack of Core Company towards placement at AED	Less IRG generation

Figure 1. Rating method for problem selection

4. Root Cause Analysis:-

A discussion has been made on the finding major causes and listed out as below

- a. Number of Theory and Laboratory courses
- b. Effectiveness of active learning techniques
- c. Interests of students
- d. Quality of students
- e. Quality of evaluation
- f. Time span required to complete ISE
- g. Difficulty level of the courses.

After discussion on above findings only four major finding we have listed out as below

- i. Number of Theory and Laboratory courses
- ii. Quality of evaluation
- iii. Interests of students
- iv. Suitability of activity chosen

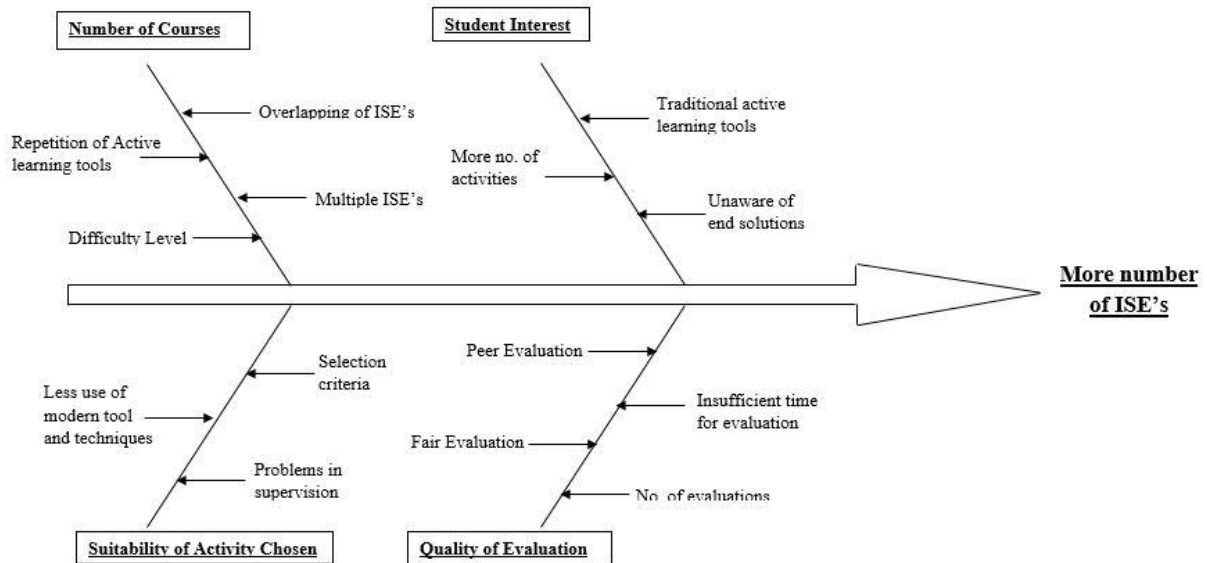


Figure 2. Root Causes Analysis

After listing causes responsible for load of ISEs on students, we classified major cause and sub cause in fishbone diagram. We get the root cause from that diagram is student had been undergo **“More number of ISEs”**. Therefore, students felt that load of ISEs on themselves.

5. Proposed Solution

After fruitful brain-storming carried out on different aspects of the selected problem, the above cause-effect analysis diagram revealed that the root cause of the problem is nothing but the higher number of ISEs conducted for all the courses during the semester. After in-depth discussion among team members, the proposed solution for the selected problem is finalized which is as-

“Combining ISEs of suitable courses to reduce the load of multiple ISEs on students”

This allows students to think differently on a given problem and can broaden their perception towards multidimensional solutions.

6. Objectives:

For implementing the proposed solution, the objectives are defined as-

1. To identify the relative courses for combining ISEs
2. To implement activity-based ISE's effectively
3. To obtain the student feedback on conducted ISEs

7. Methodology:

For this blended ISE, the methodology adopted and implemented to solve the selected problem has been based on proper discussion with department academic experts. The following plan has been outlined-

- A) Identification of relative courses.
- B) Planning of combined ISE's.
- C) Implementation and monitoring.
- D) Evaluation

A) Identification of relative courses.

The curriculum structure of B. Tech. Automobile Engineering has been analyzed well to identify the relative courses. Also, it is decided that the selected pair of courses must include the courses from the same class to maintain the cognitive level of the students. After the in-depth discussion, the different pair of relative courses have been found out as shown in the following table.

Table 2. Identification of relative courses

Pair No.	Course 1	Course 2	Class
1	Heat Transfer	Mechanics of Material	S. Y. B. Tech.
2	Theory of Machines	Electric Drives	S. Y. B. Tech.
3	Vehicle Body and Structure	Machine Design	T. Y. B. Tech.
4	Automotive Diagnostic	Automotive Electronics	T. Y. B. Tech.
5	Vehicle Maintenance Management	Vehicle Aerodynamics	Final Year B. Tech.

Various meetings have been carried out among course teachers of the above courses to select the most relative pair out of it for blended ISE. After various brainstorming sessions and feasibility checks, it is found that the pair of courses Vehicle Body and Structures (VBS) and Machine Design (MD) is most relevant. The mutual understanding of the course teachers and the possibility of student interest have been analyzed and decided to combine the ISE of these courses.

Implementation & Monitoring:

Once the courses were finalized for implementation of combined ISE for T. Y. B Tech. class, both the faculty members prepared the evaluation strategy. It was decided to form teams of 4-5 students for evaluation of combined ISE. For formation of team, the students were asked to first take Myers-Briggs Personality test. As per this test, the students were categorized in 16

different types of personality. Students were asked to make up teams with a combination of introverts & extroverts and mix of creative thinkers and innovative mindset.

An example of team formation is shown in the figure below:

VBS & MD Combined ISE Group Details

Group Number: 01 Vehicle Details: *Innova- Utility Vehicle.*

Sr. No.	PRN	Name	Personality Type
1	1851022	Amol L. Patil.	ENFJ-T
2	1851024	Ashish S. Yele.	ENTJ-T
3	1851025	Rahul K. Shelate.	ENFJ-T.
4	1851026	Vaibhav D. Kachare.	
5.	1851031	Prithviraj R. Kale	INTJ-T.

ISE 1

Figure 3: Sample group formation for Combined ISE

After the group formation, each group was assigned a vehicle. A total of 13 groups were formed. The vehicle assigned to each group was from different category and the students were asked to first prepare a presentation to highlight the aesthetic and ergonomic features of the vehicle.

Evaluation:

As per plan, the presentations of all the groups were evaluated on 8th Feb., 2020. A few pics of students presenting are shown below:



Figure 4: Phase 1 Presentations for Combined ISE

In the second phase of evaluation, students were asked to prepare a model of the vehicle assigned to them. The scaled models were to be tested on a sledge for checking the strength of the model. A sample of the model designed and manufactured by the students is shown below:



Figure 5(a) & 5 (b): Sample scaled model manufactured for Combined ISE

Since, lockdown was declared before the second phase of ISE was conducted; the marks were allotted to the students based on their progress till the time of evaluation.

The evaluation rubrics were shared with all the students at the beginning of the semester. The evaluation rubrics used is shared below:

Rubrics for evaluation of PBL (Project Based Learning) Assignment**T. Y. B. Tech. Automobile Engineering****Course Name: VBS & MD****Course Code: AE3121 & AE3021**

	Level 1	Level 2	Level 3
Formation of Team (0-5 marks)	Team formed after one week of the deadline.	Team formed within one week after the deadline.	Team formed before deadline.
	No criteria used for team formation.	Team formed as per CPI.	Team formed as per CPI & personality type.
Finalization of Vehicle (0-5 marks)	Vehicle is finalized after one week of the deadline.	Vehicle is finalized within one week after the deadline.	Vehicle is finalized as per class of vehicle category assigned to the group & before the deadline.
Aesthetic features of the vehicle (0-10 marks)	Very few aesthetic features of the vehicle are covered by the team.	Moderate number of aesthetic features are covered by the team.	All the major aesthetic features of the vehicle are covered by the team.
			Suggestions for improvement in aesthetic features are given by the team.
Ergonomic features of the vehicle (0-10 marks)	Very few ergonomic features of the vehicle are covered by the team.	Moderate number of ergonomic features are covered by the team.	All the major ergonomic features of the vehicle are covered by the team.
			Suggestions for improvement in aesthetic features are given by the team.
Presentation of the whole project to an audience (0-10 marks)	No thought given to flow of presentation and inclusion of very few activities carried out during the assignment in the presentation.	Hapazard flow of presentation and inclusion of more than half the activities carried out during the assignment in the presentation.	Effective flow of presentation and inclusion of all the activities carried out during the assignment in the presentation.
	Only one group member is aware of whole presentation and other members are contributing	All the group members are aware of whole presentation and contribute equally in the delivery of presentation.	All the group members are aware of whole presentation and contribute equally in the delivery of presentation.

	vaguely in the presentation.		
Question and Answer (0-10 marks)	Less than 50% of questions posed by the audience answered effectively by the group members.	Between 50 - 80 % of questions posed by the audience answered effectively by the group members.	More than 80% of questions posed by the audience answered effectively by the group members.
Sledge Test of Vehicle (0-30 marks)	Model is prepared for Sledge Test.	Model completes sledge test without breaking.	Model completes sledge test with minimum deflection.
	Structural integrity of the model is inadequate and proper joining methods are not used by the team.	Structural integrity of model is moderate due to the joining methods used while manufacturing the model.	Adequate joining methods are used for the joints in the are fairly intact after impact test.
Technical report on overall tasks carried out during the project (0-10 marks)	Report is vague and content is incomplete.	Report is moderately accurate and content is fairly complete.	Report is complete with all relevant data/content.
	Report is illogically organized and has grammatical and formatting errors.	Report is logically organized and has marginal grammatical and formatting errors.	Report has mention of all the aesthetic & ergonomic features along with design of structure in detail.
			Report is grammatically sound and formatted properly.

Table 3: Rubrics used for Combined ISE

Rubrics for evaluation of PBL (Project Based Learning) Assignment**T. Y. B. Tech. Automobile Engineering****Course Name: VBS &****Course Code: AE3121 &****MD****AE3021**

Group No:01	1851022	1851024	1851025	1851026	1851031
Formation of Team (0-5 marks)	04	04	04	04	04
Finalization of Vehicle (0-5 marks)	03	03	03	03	03
Aesthetic features of the vehicle (0-10 marks)	08	08	08	08	08
Ergonomic features of the vehicle (0-10 marks)	07	07	07	07	07
Presentation of the whole project to an audience (0-10 marks)	06	06	06	06	06
Question and Answer (0-10 marks)	06	06	06	06	06
Sledge Test of Vehicle (0-30 marks)	-	-	-	-	-
Technical report on overall tasks carried out during the project (0-10 marks)	05	05	05	05	05

Table 4: Evaluation sheet used for Combined ISE

Based on the evaluation of students for the combined ISE, following observations are made:

For Vehicle Body Structure course, the relative increase in ISE scores was found to be 11.6 % and for the course Machine Design, the relative increase in ISE scores was found to be 2.3 %.

At the end of semester, all students were asked to fill up a questionnaire regarding the combined ISE for two courses. Following are the questions and their responses by the students.

Q1. Has conducting combined ISE for two courses reduced the load of multiple ISEs?

Response: Yes (91.9 %) & No (8.1%)

Q2. Have you saved time due to combination of ISEs for two courses?

Response: Yes (88.9 %) & No (11.1%)

Q3. Is activity based ISE leading to better learning of the concepts of both the courses as compared to other forms of ISE?

Response: Strongly Agree (13.5%), Agree (48.6%), Neutral (24.3%), Disagree (5.5%), Strongly Disagree (8.1%)

Q4. Would you recommend combining ISEs in future or for your junior batches?

Response: Yes (83.8 %) & No (16.2%)

8. Outcomes:

After carrying out the above innovative but interesting approach of blended ISEs, obtained outcomes are as follows-

- 1) Students recognized their personality type.
- 2) Average ISE marks for both the courses are increased.
- 3) Students reported that combined ISE reduced time as well as load.
- 4) Joint evaluation by concerned faculties increases evaluation accuracy.

9. Conclusion:

The selected problem has been solved by implementing the innovative and different approach of combined ISEs of relative courses. This solution has been implemented for identified most relative VBS and MD courses found out by in-depth analysis and mutual understanding between concerned course teachers. This blended ISE has been evaluated using

specially developed rubrics. To ascertain the effectiveness of the implemented approach, student feedback has been obtained using the Google Form on the developed questionnaires.

The following conclusion has been revealed out -

- 1) Combining relative courses to conduct ISE's reduces a load of multiple ISE's on students as well as enhance their understanding of the courses.
- 2) Evaluation of combined ISEs is more appropriate to assess the actual learning of the students.