Innovative Approach of Learning the Quality Management Course Contents Through Collaborative Learning in the Classroom.

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***Abstract*— Collaborative learning is an activity where students collaborate in groups with peers. This enhanced learning innovative approach is based on the collaborative learning activity conducted in the classroom for the third-year Mechanical students for the course Quality Management. The students were divided into small groups and for each group separate contents were assigned for learning. The learning resources were searched by the students on the net using mobile phones. All the students in the class were involved in learning. After 45 minutes, each group presented their learning, followed by question-answers. Formative assessment was associated with this learning activity. Collaborative learning helped the students not only learn the contents of the course but also enhance skills like group dynamics, Google searching, effective presentations, writing skills, and oral communication. Overall, the average feedback on the activity was observed to be 8.89 on a scale of 1 to 10.**

***Keywords*— Assessment; Collaborative Learning; Learning Approach; Quality Management**

***JEET Category*—Research**

I. INTRODUCTION

Classroom learning is an important part of learning for students. It becomes extremely important for teachers to create an effective learning environment in the classroom. It creates interest and enables the learners to understand the concepts of the course in greater depth. For effective engagement of the students in the classroom, active learning tools are mostly used. With the requirements of involvement of all the students in learning, collaborative learning provides a more effective way to engage the students[1,3] and ensure effective learning under supervised conditions.

Collaborative learning activities are conducted in Third Year class for the course Quality Management. This manuscript presents the process followed for one of these collaborative activities conducted, its impact on effective learning, feedback from the students, and overall outcome.

II. LITERATURE REVIEW

Learning of the students is being focused more with the paradigm shift from “Teaching” to “Learning”. Active and collaborative learning has been practiced in the classroom for enhanced engagement of the students and effective learning, as discussed by Jadhav, M. R. (2016). Along with conducting collaborative learning activities to enhance the learning of the students, it is also used for assessment of the learning of the course. This also helps assess the students' high quotient of analytical and reasoning. Menezes et al. (2021) presented a detailed study on the same.

Shanmuganeethi V et al. (2020) observed that collaborative learning can be effectively supported by the use of Learning Management Systems (LMS). Most teachers in higher education use Moodle as LMS, which provides various support like group learning, assignments, assessments, checking the effectiveness of learning, etc. In collaborative learning, students work together in small groups for a considerable time. The bonding of the same continues beyond the timeline of activities. Bhat et. al. (2020) presented that an effective collaborative learning environment consists of making effective teams, mentoring and supporting the students’ teams, facilitating learning, and assessing the learning. In group learning of the students, various skills of the students may be enhanced, like learning skills, literacy skills, and life skills.

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Collaborative learning can make joyful learning. Jeet et al. (2023) in their research work highlighted that it becomes more meaningful and results in knowledge construction, conversation, collaboration, articulation, and reflection of the learning.

Effective learning can be addressed in various ways in terms of higher-order thinking, upskilling, multiskilling, etc. Fink's model can also be used for the same. Kolb's Experiential Learning Theory model using the stages of Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation, is also very effective in a collaborative learning environment, as presented by Salunke et al. (2016).

A collaborative learning model was developed by Siti Nur Aisyah et al. (2024) using flashcards and implemented in the school. It was found that the result of the post-test had `improved in comparison with the pre-test. The teachers of the third-year Automobile program have used the Team Game Tournament as a collaborative learning tool for the course Machine Design. They found that the performance of the students in examinations improved. Students are more focused on developing their critical thinking skills. It was a joyful learning for them. Social skills like conflict management and team dynamics were improved as observed by Patil et al (2023). A collaborative presentation of the students for a course was implemented by Kumbhar & Kalkhambkar (2024) where the students presented the assigned topics in the class and also played the role of the teacher to clear the doubts of the students. This approach helped the students enhance their communication skills, thinking skills, and confidence. The activity-based learning in the class was implemented by Naik et al. (2024), where various activities like Jigsaw, Flipped Classroom, Project-Based Learning, One Minute Paper, etc were used. They took the effort to convert traditional classrooms into activity-based classrooms.

Research was conducted by Adiyono et al. (2024) that provided the guidelines for improving learning in the digital age. This is done through the effective integration of educational management and technology. The outcome of this research also provides insights to policymakers, educators, and all stakeholders in designing strategies for digital learning for improved engagement of students.

Collaborative Online International Learning (COIL) was incorporated by Gutiérrez-González et al. (2023), which helped the students to have intercultural and global collaborative experiences. This helped the students to solve socio-cultural problems also.

Electronic Team-Based Learning (e-TBL) was used as a hybrid educational solution, which was a combination of traditional Team-Based Learning (TBL) methodologies using electronic platforms to improve collaborative learning experiences for the students. This e-TBL also helped in improving the acquisition of skills and knowledge, teamwork, and overall academic performance as presented by Makalew & Pardamean (2024). Butarbutar (2022) presented that collaborative learning can be effectively implemented for learning languages also supports social behavior, social psychology, and cognitive development. Collaborative learning was also used in the implementation of engineering design activities, which assisted in developing technical and non-technical skills of the students as presented by Van Helden et al. (2023)

collaborative learning using Active Learning Strategies (ALS) and Information Communication Technology (ICT) tools in programming courses facilitated effective ways to make everyone engaged in Teaching teaching-learning process. In those learning strategies, the students were required to respond to one another's ideas. Teachers launched the learning environment, which accommodated student requirements and classroom engagement. In this study, the benefits of ALS and ICT tool applications were analyzed for the Object-Oriented Programming course offered to engineering undergraduates. The impact analysis was done by Manikandakumar and Sridevi S (2023) in terms of teaching methodologies, practicing lab, academic percentage, attainment of course outcomes, test performances, and course exit survey. The outcomes of the research indicated that ALS and ICT approaches resulted in enhanced overall performance of the students.

Collaborative learning enhances cooperation among the students, communication skills, and develops confidence in the course content. Praveena et al. (2020) presented that it also helps the students in effective time management and enhanced understanding of the course. Collaborative Strategic Reading (CSR) is a part of collaborative learning. Safitri et al. (2023) mentioned that CSR has been used effectively to improve the reading skills of students, especially for language or humanities courses. A collaborative learning approach was also applied by Abirami, A. M., & Kiruthiga, P. (2018) in teaching Data Structures.

Kumar et. al (2022) studied the effects of Quality Management System practices in ISO 9001 certified institutes.

Collaborative learning is a very effective tool for learning. Many teachers across the globe have been using this approach in their classrooms for effective learning.

III. Exploring the needs

The following aspects are considered to explore the needs of the activities to be conducted.

1. The Quality Management course is based on theoretical aspects, and it may be difficult for the students to understand the core concepts.
2. There are no numerical practices, and student attention span in a classroom is very low as the engineering students are inclined more towards problem-solving rather than grasping theoretical concepts.
3. Learning in groups helps students learn faster.
4. Formative assessment may be associated with collaborative learning.

Considering all the above needs, the collaborative activities were planned for teaching the course Quality Management.

IV. Implementation of the Collaborative Learning Activity

The activity of collaborative learning was planned and informed to the students in advance. On the day of the actual conduct of the activity, the following steps were followed.

1. The students were divided into eight groups. The groups were so randomized to have quick and slow learners, boys and girls.
2. Each group was given a separate topic from Unit 2 of the Quality Management Course. The contents were theoretical.
3. The students were given 45 minutes to prepare only from Google Search. Mobile phones and laptops were allowed during the preparation time.
4. The groups identified the leader and divided the task among themselves. Various tasks were identified and distributed among the students by the group leaders, like searching sub-topic contents on Google, writing bulleted points, making summaries, preparing PowerPoint presentations, sequencing presentations among the group members to maintain the smooth flow, overall understanding of the contents, facing the questions, etc.
5. Each group was asked to prepare a PowerPoint Presentation (PPT). This was delivered by each group in front of their peers.
6. During the preparation time, the teacher played the role of a mentor and facilitator. This role of a teacher was very useful for the students to prepare well in the required direction and in a short time.
7. The groups were asked to deliver the presentation, where each student of each group was involved in the delivery of the learning. The presentation sequence was also randomized using the lottery system. This added the surprise element during the presentation and maintained equality during the presentation.
8. After the presentation of each group, the other groups were given a chance to ask one question per group to the group that had done the presentation. This has helped all the students to maintain their attention during the presentation of all the groups.
9. The assessment was done for the group and also per student. The group assessment was based on their learning, presentation, and synchronization. The individual assessment was based on the individual's answers.
10. Marks were allotted for each student participating in the collaborative learning activity.
11. Feedback from the students was taken after the activity.

V. Roles of the Students

The students played the following roles during this activity.

1. Google search for the data: The students were given the guidelines to do effective Google searches within a short time. The teacher guided the students to do a Google search related to the topics of the group. Books were not allowed during the activity.
2. Making PPT: The students parallelly made PPT based on their learning.
3. Making notes: A few students in each group were asked to prepare the notes, which were essential during making PPT and presentation of the same. The summary of the learnings was also maintained by each group. The tasks are divided by the group leader in each group.
4. Peer learning: The team leaders ensure that all the students are learning the concept. The students in each group learned the concepts individually and through their team members. The peer learning was highly effective, as observed during individual question-answer sessions.
5. PPT delivery: Students decided the sequence of delivering the contents of their group PPT. This has developed their skills in group dynamics, synchronization, and effective presentation.

Feedback from the students was taken as shown in Figure 1. The students participated in all the activities. Searching on Google was a major task, in which most of the students were involved.

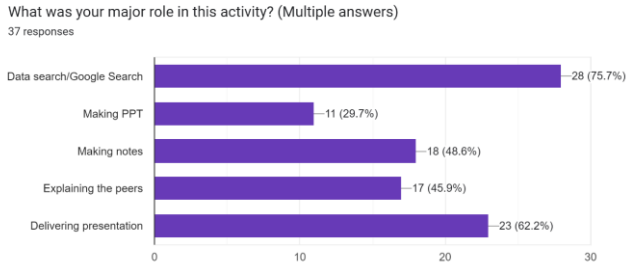

Fig. 1. Roles of the students

VI. Student Experiences

All the students actively participated in the activity. Apart from learning the course contents, the students experienced various indirect learnings. Students experienced self-learning during this activity. The students were given ample time to learn within a group. All the students were allowed to present their learning through PPT delivery. The students also learned many content within a short time. Students supported peer learning and helped each other in a group. Mentoring by the teacher during peer learning was also very effective. Students shared their experiences as seen in Figure 2. Opportunity for self-learning was a major highlight of the activity.

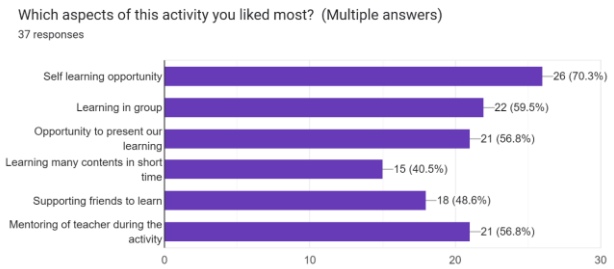

Fig. 2. Various aspects of the activity.

VII. LEARNING EFFECTIVENESS

The overall learning of the students was very effective. Oral feedback was taken immediately after the activity and was found very encouraging. The students found learning the contents through this activity very effective and easy. They found it easy to learn in groups and through their peers. The mentoring of the teacher provided the direction for learning.

The students shared their formal feedback through a Google form as seen in Figure 3. The overall rating of the learning on a scale of 1 to 10 was 8.89. This was encouraging for the students and the teacher as well.

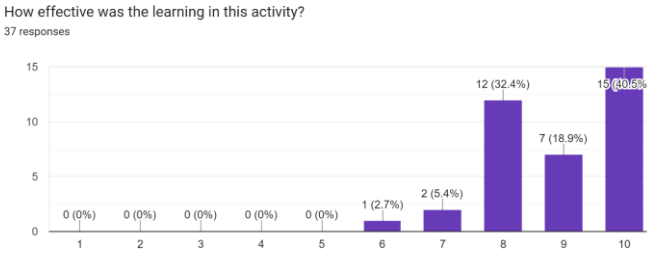

Fig. 3. Learning effectiveness.

All the students were actively involved in the activity. As compared with the normal class with lecturing, the involvement of the students was very high as they were in an active mode of learning. Overall involvement of the students was noted as 9.01 on a scale of 1 to 10. The feedback on the same is seen in Figure 4.

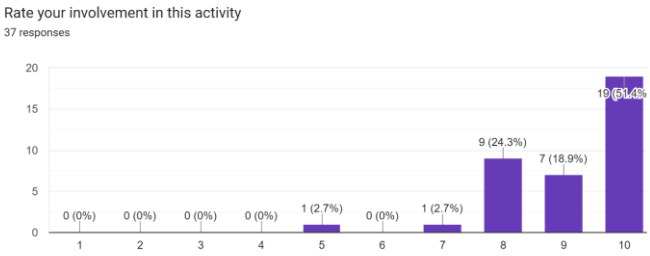

Fig. 4. Student involvement

The learning quotient of the activity was observed to be 8.95 on a scale of 1 to 10. The feedback of the students on the same is presented in Figure 5.

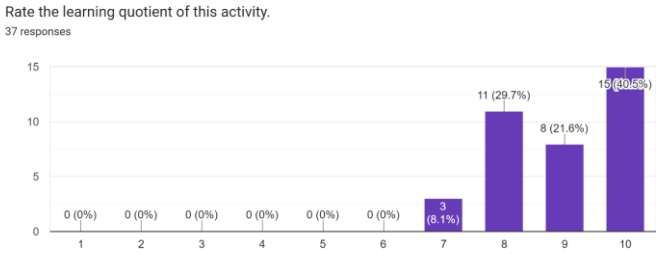

Fig. 5. Learning quotient

VIII. STUDENT RATINGS AND DIFFICULTIES

The students shared their overall ratings of the activity as seen in Figure 6. The feedback shows a rating of 9 on a scale of 1 to 10. All the students experienced quick learning through peers.

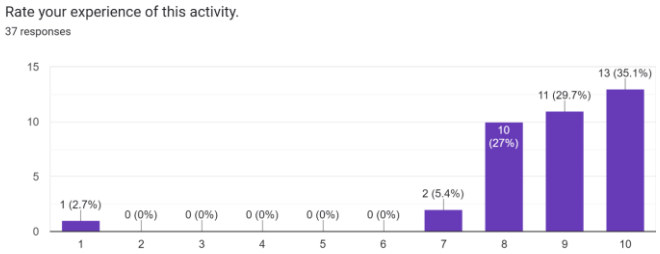

Fig. 6. Ratings of the activity.

The difficulty part of this activity was also observed. As seen in Figure 7, it was observed that the maximum number of students observed difficulty in delivering a presentation on the stage as they were not used to doing stage presentations. Another difficulty they faced was learning in a short time. The time given was 45 minutes, which was not sufficient for some of them, to learn all the contents. Within this time the students were asked to learn only using mobile phones and taking help from peers. The time limitation along with limited resources led to difficulty in learning. Some students observed teaching to peers was a little difficult. A few students took the help of the teacher to understand some of the core concepts, as they found it a little difficult to learn from their peers in the group.

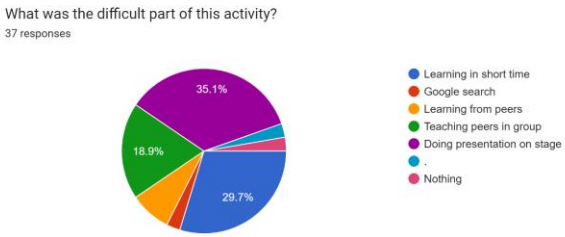

Fig. 7. Difficulties in the activity

However, along with the difficulties observed by the students, they learned the skills of learning in a short time, teaching to peers, learning with limited resources, and doing effective stage presentations. The skills improvement is shown in Figure 8 based on the student feedback.

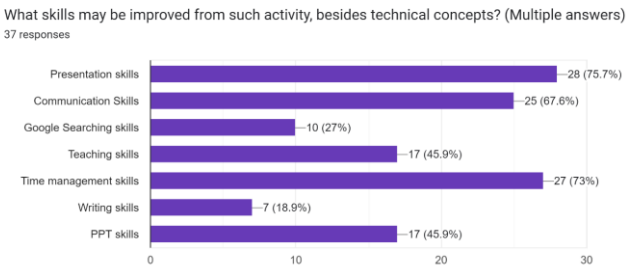

Fig. 8. Skills improvement

The following skills are improved in the activity.

1. Presentation Skills: All the students were involved in delivering the content on stage. This has helped them develop their confidence in presentations in front of their peers.
2. Communication Skills: Students searched the contents on the web and taught the contents within the group. This helped in improving the communication skills of the students. They also faced the questions raised by the other group members and answered the questions confidently. Indirectly, the students felt the need to improve their communication skills. This activity provided them with a platform to practice and improve their skills of communication.
3. Google Searching Skills: The teacher gave all the guidelines to the students for the effective use of Google as a search engine. This included various operators to be used, exclusions, inclusions, search ranges, file types, valid data types, etc. The skill of effective Google search is directly added to all the students, which they use for any type of Google search.
4. Teaching Skill: Every student got the chance to present and teach the contents to their peers. The confidence level of the students increased while delivering the content on stage. The teacher was all the time mentoring the students to give them guidelines for effective teaching and sensing effective learning.
5. Time Management Skills: Limited time was given for the activity. Each minute was very important, and the students could manage the time to learn, make a PPT, and deliver the contents on time.
6. Writing Skills: The students were asked to write the bulleted points and the summary of their learning. Within the given timelines, each group completed this task. This assisted the students in enhancing their writing skills in a constrained environment.
7. PPT Preparation Skills: Preparation of PPT was done by all the groups. The teacher provided the guidelines for preparing effective PPTs. The students understood and implemented basic fundamentals of making PPT like bulleted points, font type, and colour, background colour, simplicity, number of slides, use of images, slides flow, etc.

The glimpses of the activity are shown in Figure 9.

The feedback of the students was also taken to improve this activity in the future. The following suggestions were given by the students.

1. Provide more time for learning. They observed that 45 minutes was a short time to learn big concepts.
2. The presentation time of 7 to 10 minutes may be increased to 15 minutes.
3. The learning material may be provided along with online content.

Fig. 9. Activity Glimpses

CONCLUSIONS

The activity of collaborative learning helped the students learn the concepts easily in the shortest possible time. The key benefits of this activity can be summarised as:

1. It helped to learn the key concepts using limited resources.
2. It provided the opportunity for the students to explore learning resources available on the net and check the feasibility of using the same for effective learning.
3. Peer learning has helped the students understand the core concepts very easily.
4. The role of the teacher is changed to mentor and facilitator. This has provided new avenues for the

teachers to develop rapport with the students.
5. All the students in the class were involved in learning.
6. The learning method was associated with the formative assessment. This approach boosted the involvement of the students in this activity.
7. Various skills of the students were enhanced, like group dynamics, preparing PPTs, stage presentations, oral communication, learning from peers, effective use of mobile phones for learning, etc.

The feedback on the activity was taken, and some of the parameters were ranked on a scale of 1 to 10 as shown in Table 1. A Likert scale was used in the survey form shared with the students, wherein 1 corresponds to the lowest feedback and 10 represents the highest feedback for each question asked. This Likert scale feedback was collected for the four questions as mentioned in Table 1 as a feedback parameter. These parameters were decided based on the 'Connectivism Learning Theory'.

It is observed that the average rating of the activity is 8.98, which is encouraging to take such efforts in the future.

The overall experience was very good, and based on the student feedback, this activity can be improved in the future in terms of providing more time to learn and present. It is also possible to form smaller groups and divide the activity into two sessions.

TABLE I
FEEDBACK RATINGS FOR THE ACTIVITY

Sr. No.	Feedback Parameter	Ratings out of 10
1	Student involvement in this activity	9.10
2	Learning effectiveness	8.89
3	Learning quotient	8.94
4	Overall experience	9.00
	Average Rating of the Activity	8.98

IX. PROPOSED ACTIONS FOR ENHANCED OUTCOMES

The activity conducted can be further improved for enhanced outcomes based on the experience of the activity. The suggestions are mentioned below:

1. Time constraints: The available time of one hour was extended in the activity to two hours. However, for a big classroom, the activity can not be completed in two hours. It is recommended to take the help of peer-assisted learning by involving senior students to mentor and explain the core concepts assigned to each group.
2. Resource limitations: Students were asked to learn from Google search and online resources available only. For the next activity, a few good books and videos related to the learning content may be kept ready to reduce the time for searching.
3. Impact analysis: Impact analysis is taken using the survey form. It is recommended that the learning outcome be shared by each group in the form of video content creation and sharing comments to improve the activity.

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