

Use of Active and Collaborative Learning Techniques in the Course Digital Communication of Electronics and Telecommunication Engineering

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Abstract: The Proposed paper is related to use of active and collaborative learning techniques in the course digital communication of Electronics and Telecommunication Engineering branch at Rajarambapu Institute of Technology, Rajaramnagar where large population of students is from rural areas. Although many researchers have confirmed that active and collaborative learning techniques are very useful in improving learning, motivating students, bringing critical thinking skills in the students, we need to develop special strategies for students with rural background. In this study, initially the learning styles of the students are obtained using Felder's learning style index survey. The active and collaborative learning techniques are implemented for this class and found that irrespective of the background of learners active and collaborative learning techniques are very beneficial to students for their learning. Only challenge is that instructor has to take some additional efforts.

Keywords: Learning styles, active learning, collaborative, STAD, rural.

1. Introduction

Number of studies has been done on the effectiveness of active and collaborative activities but this paper focuses on a course digital communication and a special segment of students coming from the rural areas.

Patrick T. Terenzini, Alberto F. Cabrera, Carol L. Colbeck [1] have examined the extent to which undergraduate engineering courses taught using active and collaborative learning methods differ from traditional lecture and found that active or collaborative methods produce both statistically significant and substantially greater gains in student learning than those associated with more traditional instructional methods.

Collaborative learning is working together with the intent of enhancing learning outcomes for all involved. According to ÖzdemirGöl, Andrew Nafalski [2]. It is better suited for the modern teaching and millennial learners through active learning, student-centered learning, problem-based learning and project-based learning. However they also mentioned challenges such as students entering into university engineering programmes come from vastly different educational, cultural and personal backgrounds, they will have their favorite learning styles and will process the information they receive in different ways.

The benefits of cooperative learning are not

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automatic, however, and if imperfectly implemented, the method can create considerable difficulties for instructors, most notably dysfunctional teams and student resistance or hostility to group work Richard M. Felder, and Rebecca Brent [3]. They have suggested some remedies to take care of these difficulties.

2. Index of Learning Style

There are differences in the traditional teaching styles of professors and learning styles of students in engineering education. It results into inattentiveness of students in the class, poor performance in the tests and in some cases drop out of the college [4]. According to learning style model of Felder and Silverman, students learn in many ways - acting and reflecting, sensory and intuitive, visual and verbal, sequential and global. The Felder-Soloman Index of Learning Styles (ILS®) is collected from the students of Third Year B.Tech class systematically using online questionnaire. The results of this questionnaire are shown in the table 1.

Table1. Learning style responses of students in percentage

Learning style	Strong 7-11	Moderate 3-5	Neutral 1
Active	25%	40%	18%
Reflective	-	6%	11%
Sensory	32%	18%	25%
Intuitive	-	4%	21%
Visual	75%	18%	7%
Verbal	-	-	-
Sequential	36%	29%	4%
Global	4%	7%	20%

From this table it is observed that 65% of students are comfortable with active learning and 6% are with reflective, whereas 29% students are neutral, so it can be concluded that 94% students can learn through active learning. Similarly 96% students show sensory learning style, 100% students can learn better through visuals and 89% students are sequential learners including neutral responses. These results imply that the active and collaborative activities are suited to this particular class.

3. Active Learning Techniques

The active learning can be defined as any instructional method engaging students in learning

process, which requires students to do meaningful learning activity and think what they are doing[5]. Some of the active learning techniques such as concept tests, brainstorming and think- pair- share were implemented in the class. These activities are short activities which take only five to seven minutes to complete.

1) Concept test- A Multiple Choice question with five distracting options which reflect misconceptions is asked. Students have to respond. No. of responses for each option are counted with the help of placards and a histogram drawn to represent those responses. Students were asked to reconcile the answers after discussing with peers. Finally the correct response was discussed and clarified why other options were incorrect.

2) Think-Pair-Share- A question is posed demanding analysis and synthesis. E.g. which coding scheme yields maximum coding efficiency for the given message? Two minutes were given to students to think over the problem (Think). After this time students pair up with the partners and share their responses (Pair). In the third stage the student responses were shared with the entire class. About 70% students were actively participating in this activity as opposed to traditional class where only active individuals respond to teacher's question.

These activities in the class made class live and full of enthusiasm; students accepted such activities since these are different than conventional teaching methodologies. Most of the activities went as planned. The challenges that may encounter in implementing active learning activities are, they require lot of planning and sometimes things go wrong as far as resources are concerned. As major chunk of class is from rural areas, some difficulties occurred. There were few students who were not participating due to their shyness and difficulty in communication. After some corrective actions such as counseling and motivation of such students the activities went successful.

4. Collaborative Learning Techniques

Collaborative learning is supported by many researchers as it provides students an opportunity to engage in discussion, work in teams, take responsibility of own learning and become critical thinkers[6],[7].

Problem based Group writing Tutorials/assignments and Student Team Achievement Divisions (STAD), are implemented for the mentioned class.

1) Problem based group writing assignment- In this activity different heterogeneous teams were formed and sets of problems were given to these groups. In each group all team members have to solve these problems collaboratively. The solutions of the problems solved by one group are then shared with all other groups to have knowledge of solving all the problems in given sets. Every individual has to contribute in this activity. This particular activity has resulted into better performance of students in the Mid- Semester Examination for the course Digital Communication. The performance of the class is shown in the table 2. It is observed that after this activity about 48% students obtained highest grades, whereas only two students got lowest grade in this exam. Probably it is because of the inattentiveness and non-participation in the active learning and collaborative learning activities. Since these are the same students who did not show interest in such activities.

Table 2. Performance of students in Mid-Semester-Exam

Range of score (out of 50 M)	40≤50 AA and AB Grade	30≤40 BB and BC Grade	20≤30 CC and CD Grade	<20 FF Grade
% of total students (77)	48.0% (37)	32.5% (25)	16.9% (13)	2.6% (02)

2) STAD activity- Student Team Achievement Divisions activity in which the class is divided into heterogeneous teams on certain criteria such as sex, performance level and living place. The above mentioned class is divided into 13 teams with six students in each group. To have heterogeneity the teams are formed on three criteria such as academic performance of student in the previous three years, fair distribution of males and females and background of students i.e. the living places of students. These criteria are chosen because; the group should have students with different intellectual capabilities. It must be mix of girls and boys equally distributed in all teams. The background of students in the form of their living places. There were three categories such as students from metros, tier 2 cities and villages. Here the teams are formed by instructor since they perform better than self formed teams [8]. The in class presentations and lectures were given on the topic

digital transmission and the students were asked to work on the lessons and master the contents in the team. The activity was performed over a period of two weeks. To keep discussion going on, students were asked to meet at least once in two days for one hour and work on the topic given. Team coordinators were selected to monitor the activity and asked to report whether the team members are participating? Few students were not interested in doing such activities, they believed in their own performance. Such students were counseled and motivated to participate. Such students could not perform well in the test conducted for this activity. The performance of the teams in this activity is shown in the table 3.

Table 3. Performance of students in STAD activity

Team Number	Number of students	Team Score (Median Score= 7.62)	Team Performed less than median score (yes/no)
1	6	9.0	Yes
2,4,6,8	6	7.67	Yes
3	6	8.2	Yes
5	6	7.33	No
6	6	7.5	No
7	6	8.0	Yes
10	6	8.0	Yes
11	6	7.3	No
12	5	8.2	Yes
13	5	6.4	No

Out of 13 teams 9 teams performed well whereas 4 teams were below median score. The individual score for all the students is calculated from weighted averages. Individual score in the test is weighted for 0.6 and team weight is 0.4.

5. Conclusion

The student feedback after active and collaborative activities showed the enthusiasm and interest of students in such activities. These activities are applicable to all types of courses and students with different backgrounds. The challenges that instructor has to face are non participation and lack of interest in such activities. With the motivation and counseling, it may be possible to improve the participation and ultimately the academic performance of students.

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