

# Impact of Cognitive and Collaborative Learning on Refrigeration & Air Conditioning Course

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**Abstract:** Now a days learning through direct standing instructions is not measurable. In order to enhance the learning of students for core engineering subjects, student should participate in the process facilitated for their learning. Cognitive & Collaborative learning are learning tools suitable for R&AC course. This paper focuses on the improvements occurred on how a student reasons information & student team work.

**Keywords:** Collaborative learning, cognitive learning, teamwork, engineering students.

## 1. Introduction

Cognitive and Collaborative learning is one of the techniques where the students participate in the process in order to explore themselves to achieve the given task. Dr. Glenn W Ellis et.al [1] 2014, describes the learner centered classroom through collaborative learning, case study taken number of students (N=43), as a result (N=39) female students, they learned more in collaborative learning compared to traditional way of teaching. Survey results of student opinions on the traditional method, there is evidence consistent with knowledge-building pedagogy changing students' conceptualization of learning from being more teacher-centered to being more learner centered. Jacob Lowell Bishop & Dr. Matthew A Verleger [2] 2013, describes the case study on flipped class room and collaborative learning pedagogy gives the good result. It is found that Students in the flipped classroom pedagogy scored significantly higher on assignments and tests. Rebecca A Bates & Andrew Petersen [3] 2011, explain the how to provide collaborative learning opportunities and good response on exam result by adding a team component to examinations.

Case study, he has taken the number of students (N=251) majoring in engineering, chemistry, mathematics, physics, computer science, biology in the institution. Maximum students understand the topic very well. Prof. Michael H.G. Hoffmann & Dr. Jason Borenstein [4] 2012, this paper elaborates on the importance of students to collaborate in teams and to improve critical thinking and argumentation skills. Mapping in problem-based learning environments provides an exciting opportunity for students to develop critical thinking skills and the ability to collaborate in teams. Joanna Perry Weaver et.al [5] 2016, this paper describes how a cooperative learning intervention might improve both students' affective and academic experience in this course. In this pedagogy students (N= 113) 80.99% students felt that they learned and given the positive response towards collaborative pedagogy. Concluded that future research is needed to compare the causal effect of a collaborative learning on observations of belonging and collaboration, compared to other instructional methods. Colin J. Neill & Joanna F. DeFranco [6] 2011, describes the effect of the cognitive collaborative model and benefits of the CCM in improving engineering team performance and investigated the mechanisms that facilitate this improvement. Cognitive learning pedagogy increased mindshare and more effective communication among team members generates social constructivism through social construction.

By following Dr. Glenn W Ellis et.al [1], cognitive and collaborative learning pedagogy gives good result compared to traditional approach.

## 2. Method

This study was conducted on students completing the course, "Refrigeration & Air Conditioning course" (N=76) for Mechanical Engineering students. The course contains 50% problem and 50% of theory. In collaborative learning students are divided into 14 teams. Each group is assigned to interact a part of a problem or case study. Each group containing 5 to 6 students. In a given problem one team discussed on given data, other group discusses on required data, formulas. The team should interact with each other

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and come up with solution. The collaborative learning pedagogy applied as shown in fig. 1



Fig.1. Teamwork in collaborative learning

Cognitive learning is a student processes and reasons information. In this students are divided in to teams. The problem will be given each team should solve the problem based on the process of acquiring and understanding knowledge through our thoughts, experiences and senses. In this pedagogy after solving the problem from each team one student will explain the problem to others. Cognitive learning pedagogy is applied shown in fig.2



Fig.2 Cognitive learning



Fig.3. Collaborative and Cognitive Process

Fig.3 shows the collaborative and cognitive process, at first team will be done and separate problem or case study given to each team. After solving the problem by team assessment will be done in group vice. Each group has a time limit of 40 minutes. After solving the problem of subject evaluation will be done in team wise.

From two sections contains 76 students, around 90% students are involved in team work, collaborative and cognitive learning they solved the problem within the time limit. 10% of students lagging behind due to communication gap, but all 10% students have solved the problem with a time of 1 hours. After evaluation process feedback has been taken 95% student felt that they have learned in collaborative and cognitive pedagogy when compared to traditional approaches.

### 3. Results

Fall2016 batch student the collaborative and cognitive pedagogy approaches followed in Refrigeration & Air Conditioning Course. The class contains total of 71 students. In the internal assessment evaluation 76% students got more than 15 marks having an average of total 25 marks and 24% of students got less than 15 marks shown in Fig.4.

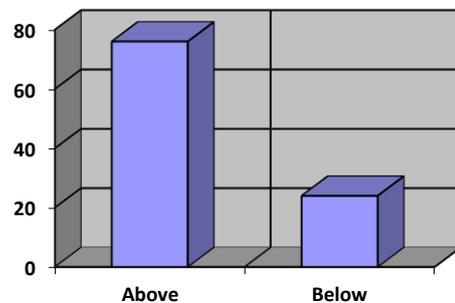


Fig.4. Internal assessment evaluation results

As per university exam 31% of students passed in this subject shown in fig. 5.

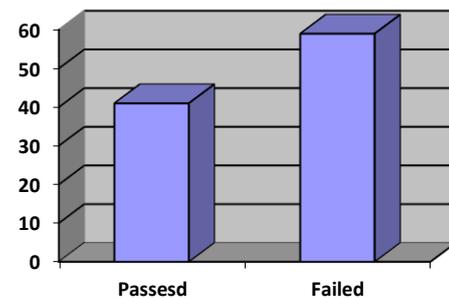


Fig.5. University results

Fall 2016 batch 41% of students passed in this course and 59% of student failed. The students are learned how to solve the problem in team. In this process student university passing results for this course got less but team learning, leadership ability and communication improved.

Challenges phased while conducting this pedagogy is, team contains 5 to 6 students, if two or three are regularly absent in the previous session, it is very difficult for the team to involve in the session while solving the problems. For absentees are not able to catch the things learned in previous class.

#### **4. Discussion**

By following previous research paper Perry Weaver et.al [5] 2016 the collaborative method was applied 80.99% student felt that learned in this pedagogy compared to traditional method.

In this course from two sections contains 71 student and 90% students felt that from collaborative and cognitive learning they learned good communication, leadership, problem solving technique and teamwork. The main purpose of the study was to improve the student learning ability, skills and teamwork in the students. This paper suggest that instructor should adapt pedagogy in engineering education so that students are actively participated in teamwork. Perhaps, different teaching and learning strategies have to be adapted to improve the results. In addition to self-regulatory behaviours such as study planning and study management which are used to measure motivational behaviours

#### **5. Conclusion**

Collaborative and cognitive successfully implemented in this course. Therefore, students were engaged in subject specific discussions with peer which developed their technical communication and most of the students solved numerical precisely when asked for internal exams as they are aware of how to segregate a problem and solve step by step. Student understood how to analyse a problem or a process if it deviates from theoretical information and reasons. Successfully found solutions for problem, thereby enhancing their problem solving skills which reflected in their internal exams.

Limitation of this study is if section having a more than (N=100) it is very difficult to apply collaborative and cognitive for refrigeration and air conditioning course. If students are having less numbers (N=>80) this pedagogy can be applied. . Mentoring, facilitating and managing were biggest challenge as the class size was large

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