

Improving Problem Solving Ability of Student Through Cooperative Learning

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Abstract: Traditional teaching learning methodologies are not that much efficient in today's teaching age. The demand of present age group of teaching learning with an innovative strategy is huge one [1]. The main focus of this paper is about the collective efforts needed to be taken to improve the ability of students in problem solving with the innovative teaching learning method for cooperative learning. This mentioned methodology was applied to teach the course Digital Systems and Microprocessors for the second year B.Tech computer science and information technology students at Rajarambapu Institute of Technology, Sakharale. The objective of this activity has to analyse the students' problem-solving ability through cooperative learning. The evaluation of the results demonstrates that collaborative learning enhances the students' confidence and their involvement in the learning process.

Keywords: Problem solving ability, Cooperative learning, Discussion Forum, thought process

1. INTRODUCTION

Engineering education in the 21st century has created various learning platforms such as critical thinking, problem solving, Communication and Collaboration Skill, and the concept of engineering itself. Problem solving is amongst the main motive of the 21st century's slow learning students to advance including in engineering learning.[2] To teach digital system and microprocessor course is somehow challenging because it contains lots of numerical as well as designing problems. Since problem solving is a tricky method of finding the correct way which finds a solution, so it is difficult. Problem resolution is a technique that involves using certain measures (heuristics), often referred to as a model or problem-solving steps to find a solution. Heuristics are the common guidelines or steps used to help in solving problems. These policies, however, do not ensure the success of the individual in solving the issue. [3] Collaborative problem-solving skills are therefore a significant to meet cognitive

ability. Students learned more efficiently if they are active rather than passive during the teaching phase (i.e., deep learning rather than superficial learning). In general, learning through doing is more efficient than learning through listening or reading, and when learning is through doing (using data to fix a issue), students are more likely to remember what they have learned, and The information they receive is also more likely to be processed and reflected on how they learned, especially if there are incentives to do so.

Table 1: Difficulties with Problem Solving

1. Student has many problems with problem solving
2. Afraid to make decisions
3. Student goes through one or more steps inadequately
4. Problem solving process is not easy
5. Problem solving individually limit the thought process.

2. COOPERATIVE LEARNING

It is a teaching and learning approach that involves groups of students working together to finish a job, solve a problem or generate a product with unique requirements [5] Collaborative learning is based on the idea that learning is a natural social act in which members talk to each other. It is based on values as follows:

- I. Learning is an effective method through which learners assimilate the data and connect the fresh understanding to a previous knowledge structure.
- II. Learning needs a challenge that needs students to actively participate with their colleagues

2.1 Why use it?

Documented results shows the

- Improved academic performance.

- Improved behaviour and attendance.
- Increased self-confidence and motivation.
- Increased liking of college and classmates.
- Implementation is comparatively simple and cheap.

2.2 Cooperative learning effects

- Research has shown that the proper use of cooperative learning results in improved student accomplishment, increased self-esteem and increased recognition of learners with unique requirements
- The beneficial effect on student accomplishment is linked to the policy of setting objectives or priorities for the group while requiring individual accountability.
- In this manner, group members are encouraged and encouraged to assist each other through the assignment in hand.

There is powerful proof that cooperative learning and closely organized group work are efficient learning strategies. [4] Studies revealed that working together on an issue and considering each other's thoughts resulted in enhanced conceptual knowledge and abilities in problem solving.

3. IMPLEMENTATION

This activity was done in two different phases

- I. Student working on problem Individually (1hr)
- II. Students working in group on same problem. (1hr)

I. Student working on problem Individually

The following problems were given to the students to work individually on it and assign time is 1 hr.

- Convert the given number in one system to another number system
 - a. $(535.25)_{10}$ to $(?)_2$
 - b. $(675.625)_{10}$ to $(?)_{16}$
 - c. $(1220)_8$ to $(?)_{10}$
 - d. $(11010010110011)_2$ to $(?)_8$
- Calculate the addition and subtraction of following number

a. $(67)_8$ and $(23)_8$

b. $(40)_{16}$ and $(34)_{16}$

- Given the logic equation $f = ABC + BCD + ABC$

a. Simplify using K-map

b. Realize the equation using NAND gates only

- Realize the expression $f(A,B,C,D) = \sum m(0,1,2,3,11,12,14,15)$ using 8:1 multiplexer

- Write an assembly language program in 8086 microprocessor to find largest number from the given array

- Write an assembly language program in 8086 to find factorial of given number



Figure 1: Students work individually on problem

II. Students working in a group on same problem.

1. Group formation of 3-4 students.
2. Each group should work on the assignment/program given to them.
3. Each group to explain an important or original portion of their work.
4. The instructor can Monitor and assist as needed.
5. Suggestions given to the students for improve their involvement in the group.

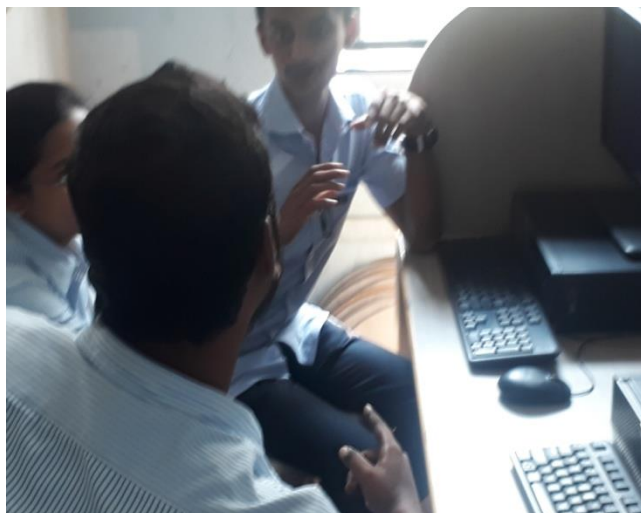


Figure 2: Students work in a group on problem

The teacher is not just the giver of knowledge. Although the teacher has an important knowledge source of the content and skills that are needed and still he/she provides that to the learners, he / she also values the knowledge, personal experiences and culture brought to the practice by the learners.

It has been observed that the student's performance in the experiments associated with topics namely Logic Gates ,number system, Boolean algebra, combinational circuit and microprocessor (for which above mentioned teaching learning methodologies have been applied) is improved. Also the student's feedback on each activity has taken into account for measuring the overall performance of the activity which is shown in figure 3.

Re: Formal cooperative learning in Laboratory exam
by **sushant pavashe** - Monday, 8 October 2018, 11:08 AM

It is very useful activity.While working in group I can easily find my mistakes regarding to any concept and easily solve it by discussing it with other group members.

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Re: Formal cooperative learning in Laboratory exam
by **prerana ingale** - Monday, 8 October 2018, 11:17 AM

In this activity,i learn how to work within a group and how to solve problems regarding any concept within group by discussing it within group .it will helpful for further group activity in other subject also.

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Re: Formal cooperative learning in Laboratory exam
by **prathamesh kshirsagar** - Monday, 8 October 2018, 11:18 AM

This method is very useful for learning the things which we cannot learn by traditional teaching learning method. also it is useful for group activities..

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Re: Formal cooperative learning in Laboratory exam
by **sanket shendge** - Monday, 8 October 2018, 11:55 AM

It was very good activity. It is helpfull in programming,it is easier to correct errors and modify program instruction. I learn a lot from this activity.

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Re: Formal cooperative learning in Laboratory exam
by **satyajeeet mane** - Monday, 8 October 2018, 11:57 AM

it is a very good activity for those who are lagging in communication skills to improve their communication skills and doing some work collaboratively and effectively with the help of others.

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Re: Formal cooperative learning in Laboratory exam
by **ankita patil** - Monday, 8 October 2018, 12:01 PM

It is very useful activity,this activity teaches how to mange in groups.

We can easily find our mistake because our mistakes are corrected by our group members.

And concepts are cleared for effectively.

Figure 3: Students feedback on cooperative learning

So, last two years the cooperative learning methods have been used for this course and which gave better results. Individual performance of student was comparatively good when they are working in a group and good thought process

The students ' confidence level has increased and the results have been comparatively good.

4. RESULT ANALYSIS

To analyse student understanding and to find out most accepted methodology by the students, feedback was taken of total 70 students.

Table 2: Individual performance of student

Chapter No	Title	Average Marks out of 20		
		2016-17	2017-18	2018-19
1	Number System	15.5	16.2	17.5
2	Digital Logic	16.7	17.2	18.2
3	Boolean algebra	13.7	14.4	15.6
4	Combinational circuit	12.9	13.1	14.7
5	Microprocessor	13.4	14.9	16.5

The Individual performance of student was very poor as they don't have a proper thought process and lack of corrective process and when they are working in a group the performance of students are increase as good thought

process done in a group and different alternative solutions have found out.

Table 3 Performance of student with cooperative learning.

Chapter No	Title	Average Marks out of 20		
		2016-17	2017-18	2018-19
1	Number System	15.5	16.2	17.5
2	Digital Logic	16.7	17.2	18.2
3	Boolean algebra	13.7	14.4	15.6
4	Combinational circuit	12.9	13.1	14.7
5	Microprocessor	13.4	14.9	16.5

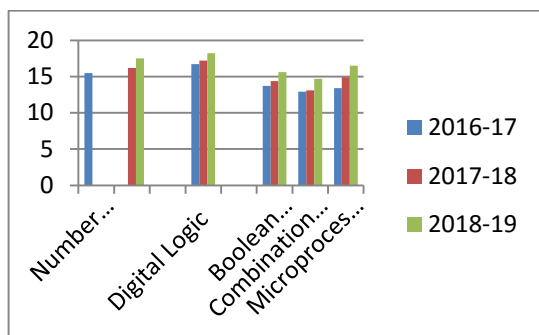


Figure 4: Individual performance of student

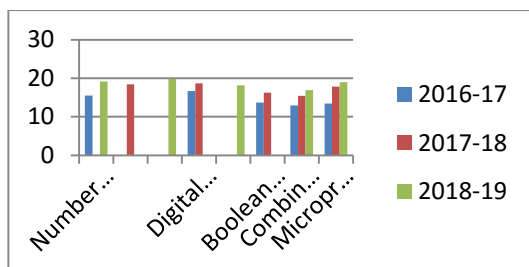


Figure 5: performance of student with cooperative learning

After analyzing these results, it is shown that the cooperative learning process has produced some valuable outcomes.

Outcomes of cooperative learning's

- To improve academic commitment by working with students.
- To work cooperatively in small groups toward a group objective.
- To promote the teaching of each other.
- To develop the social interaction abilities of students

5. CONCLUSION

Efficient use of cooperative learning in classroom teaching has been suggested and implemented to teach the course Digital systems and Microprocessors in the department of Computer Science & Information Technology at Rajarambapu Institute of Technology, Sakharale. It has been observed that this activity shows the more involvement of the students and better understanding of the concept. Students have worked cooperatively in small groups toward a group goal there is improvement in average marks of the respective chapters. Also, the student's opinion has taken in to account to analyse the overall impact of the activities and it shows that the cooperative learning for problem solving has been the most favourable activity among other activities applied for other subject.

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