Promoting Peer Assisted Learning and Developing Leaders

Jyoti Bali[1], Arunkumar Giriyapur[2]
Department of Automation & Robotics, BVB CET, KLE Technological University, Hubli, Karnataka
[1]jyoti_bali@bvb.edu, [2] aaron@bvb.edu

Abstract
Here the efforts of ensuring the effectiveness of team based activity planned under the course Analog and Digital Electronics (ADC) involving Peer Assisted Learning are presented. Course concepts can be effectively conveyed to students by solving problems on a regular basis. The course ADC is an important course under Automation & Robotics program providing fundamental concepts which are prerequisites for studying the higher end subjects prescribed under the program. Developing the skill of problem solving and analysis is the critical need of the course. This was taken up as the objective wherein a team based activity was designed for promoting a high level peer to peer interaction involving students from different grades forming a team to solve problems, analyze the result and summarize. The activity was designed to promote cooperative learning environment in turn boosting the confidence level and problem solving ability of students in a phased manner. The challenge was to address the needs in a justifying manner for the weaker and lagging students. Emphasis is also on building some specialized skills like leading the team, owing responsibility of the team, demonstrating interpersonal skills, developing team spirit and enthusiasm among the set of students chosen as leaders of the activity. Hence the objectives of the proposed activity, process of selecting of leaders, the criteria of forming team, mechanisms introduced to supervise the implementation of the activity on a timely basis, role of faculty coordinator , the results achieved and the analysis of student feedback on the on-going activity are discussed and presented.

Keywords—Analog &Digital Electronics , Peer Assisted Learning, Automation & Robotics, problem solving and analysis, peer to peer interaction, cooperative learning environment

I. INTRODUCTION

Peer Assisted learning (PAL) is a strategy that can be employed by any learner to improve his/her learning capability with support and cooperation of peer group. PAL can be used by the course instructor as a supportive pedagogical tool to help each student achieve his academic goal effectively[1]. Here the efforts put in this direction to make PAL work for the course Analog & Digital Electronics[ADC], an important course under Automation & Robotics, an undergraduate program are discussed. The course ADC covers essential basics of Analog Electronics and Digital Electronic circuits required for building Automation and Robotic mechanisms and hence provides prerequisites for the high end subjects like Control Systems, Mechatronics System Design and Power Electronics, Motors & Drives. There are many challenges faced by the teacher conducting the course like the need to cover fundamentals of both Analog Electronics and Digital Electronics portion as a 4credit course, which otherwise would be conducted as two separate courses in any other engineering program. The second challenge is to address the needs of diploma passed out students from mechanical background joining the course directly without any bridge course for the subject. This was the major contributing reason for the higher number of failure students under the course during intermediate as well final test. Table 1.0 shows the results of students of earlier batches in their intermediate and final test results. The failure percentage was found to be around an average of 20-25% , in every yearly batch, which was a major area of concern. Third challenge is that the course ADC being problem oriented, even the average students find it difficult to solve the problems of higher complexity. In order to meet these challenges , the strategy implemented by course teacher in the past was to conduct extra classes for each of the topic and help students in solving the assignments given. But the results were not so encouraging. The success rate for the course in terms of pass percentage of students over the last few years was only up to an average of around 80%.

Table 1.0 Analysis of ADC Course result for different batches of students

Activity	Minor Exams Result %	SEE Exam result
2011-12 batch	70%	76%
2012-13 batch	75%	80%
2013-14 batch	80%	82%
2014-15 batch	78%	81%

The faculty coordinator could not monitor closely the performance of each student in a class of around 60-70 students and analyze the feedback effectively. It was evident hence, required to device some mechanisms to improve the skill of students in problem solving and analysis through team based Peer assisted learning activity. Faculty coordinator needs to ensure that the benefit of the proposed activity reaches each and every student member in the team, thus boosting their learning process and improvement in their

skills [2] . Hence it was the responsibility of the course teacher to address these issues in the best possible way by designing the activity in choosing the leaders, providing of regular guidance and supervision, empowering the leaders for effective team work and owing of responsibility as well introducing mechanisms for regular follow up.

Every student learns at his own pace which may not match that of others. In PAL, the idea is to encourage faster learners and make them as leaders for a group of students each, so that they can initiate peer-peer learning [3] . Thus team based PAL activity helps both the fast and slow learners. The fast learner develops the improved skill of problem solving as well refine his/her skills like leadership skills, communication skills, team work ability, proactive behavior. Even there are few limitations , which can be due to the loopholes caused by inefficient management of PAL process. Figure 1.0 explains the advantages and limitations associated with PAL activity.

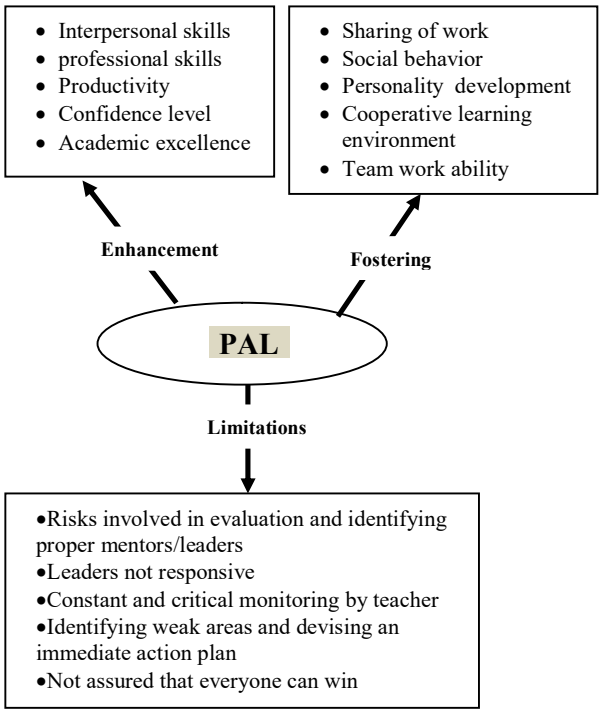

Fig1.0 Advantages and limitations of PAL

II. METHODOLOGY OF IMPLEMENTATION

Here, the details of the activity implemented for the course Analog & Digital Electronics (ADC), at II year level for students of Automation & Robotics is presented. It is a challenge for course teacher to teach as ADC being a target course , under which two large sections of Electronics, Analog and Digital Electronics are taught. Hence the need was to introduce some special activities so that the student learning can be made effective and faster. Activity was planned mainly to address the needs of the lagging students in the subject, so that they can cope up with the coverage of theory concepts covered under each class.

At III semester level , major portion of students are not known to each other and not interacting much. Around 25% of the students come from Diploma background in Mechanical, Mechatronics and Automobile domains. Addressing the needs of diploma should be done on day to day basis which was not possible by only a teacher through classroom sessions. But they needed basic concepts of Analog & Digital Electronics to cope up with the syllabus coverage. Table 2.0 shows the feedback received from students in compiled form before starting the activity, after students registered for the class under piazza. Students from diploma background felt the urgent need of the activity of peer assisted learning to be implemented, as they were genuinely interested in overcoming the lag in solving problems, because of the lack of basic skills in the course.

Table 2.0 Feedback before implementation

Activity	Regular	Diploma background
Interest shown in joining the Team based activity	80%	95%
Need of such an activity exists	85%	100%
Volunteered students to be leaders	30%	10%
Positive Response of Students through Piazza	80%	60%
Enables sharing of views, ideas, possible	60%	40%

Identification of students, who are quick grasping and regular to classes were made as team leaders responsible for monitoring the progress of less confident and lagging team members they were having assigned with. PAL activity aimed at initiating group discussions, exchanging of ideas, building cooperative learning environment. problem solving in teams, clarifying each other's doubts, analyzing in team and approaching teacher confidently.

Team based activities support students growth in variety of ways. Under peer assisted learning activity, the two key areas of focus were one to develop a support system for the weaker and lagging students in the problem solving and related to the course Analog and Digital Electronics and second is to foster the leadership skills among a set of students who are academically stronger to emerge as smarter team leaders. First and the foremost task of the course teacher was the identification of students , who can take up the lead of the team which involved counseling and motivation of the students by explaining the advantages of accepting the leadership role in the activity. As the team formation had to be done from the first month of teaching, the students who were active and attentive in the class were identified and checked about their willingness to be leaders of the teams. Around 75% of the selected students agreed to be the team leaders, as the

activity has to be done voluntarily and with interest. Thus selected team leaders were assured of all the support and guidance by the faculty coordinator on regular basis. Thus a total of 17 leaders were finally selected for the teams comprising of around 3 members each. Team formation was based on a rule that it should comprise of necessarily at least one diploma based student. There was autonomy given to the team leaders to opt for the members as per the rule and the mutual consent of all members. This was practiced mainly to reduce the conflicts that may arise otherwise.

The course teacher interacts directly with the team leaders through regular meetings and the communication structure as defined below in Fig 2.0. Under the PAL process, course instructor is the mentor for all teams along with leaders. Figure 2.0 shows the communication flow between teacher and the team leaders and also among the team leaders themselves. Thus it was noted that the activity this facilitates a robust communication between teams to support each other in the activity. Figure 3.0 shows the communication flow between each team member with leader as well the intercommunication between team members.

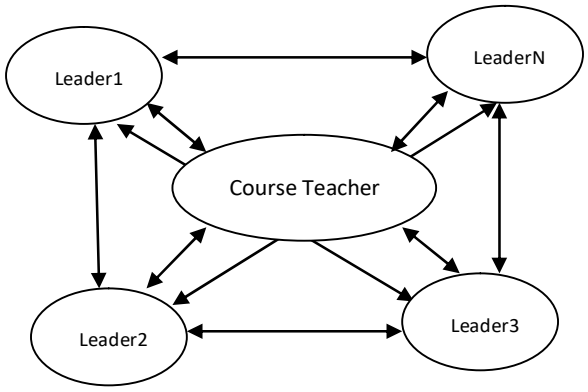

Fig 2.0 Communication between leaders and course teacher

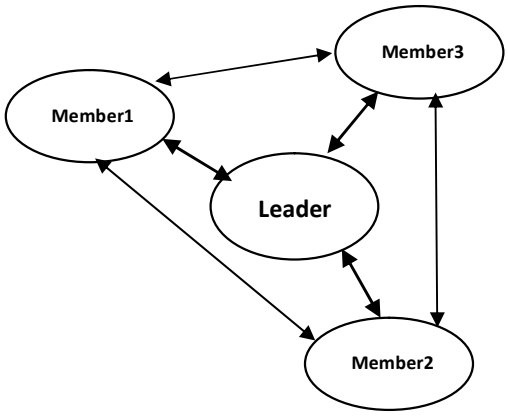

Fig 3.0 Organization of Team with a leader and three members

members, correct the submitted assignments, clarify their doubts, assign them the practice assignments, providing feedback of their team performance to teacher and so on. In order to improve the robust interaction among the leaders and the team members, we used web enabled technologies like Massive Open Online Course (MOOC) extensively [4].

In order to establish the regular communication with leaders and the entire class of students, course instructor created a class for the subject ADC, in Piazza, a very popular MOOC Tool where each of the leader and team members should register as members. Piazza has emerged as a very powerful online platform facilitating the communication between students and teacher. It is a very easy to use free tool bringing together the members of the class , teacher and students in one space. This communication platform helps save time by giving providing access between students and the instructor at their convenience. A person enrolled can maintain anonymity, to give his/her feedback without any hesitation. There is a provision for each of the registered participants to post their views and questions as and when they login and can get status of the progress on syllabus coverage, assignments posted, announcements and the feedback about each activity. Students have an easier access to the class related information and the course teacher at any time. It provides the transparency of communication and freedom of expression. This is indeed a great step in reducing the distance between teacher and the students. The framework designed and implemented for the course ADC can be seen as shown in fig 4.0.

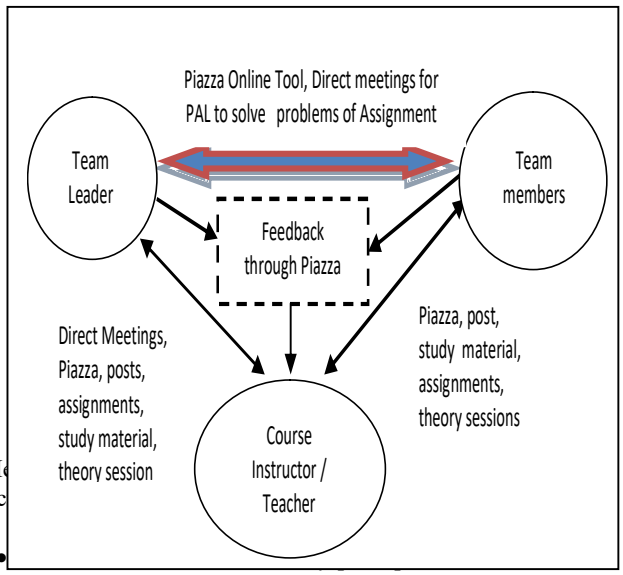

Fig 4.0 Use of MOOC tool to build robust communication

- opportunity to coordinate, communicate and do problem solving in a cooperative environment.
- To make the activity productive and useful for everyone both the leader and the team members.

- To ensure that the selected student to emerge as a leader with team spirit and interests upheld.
- Simplify the task of faculty coordinator in clarifying their doubts related to assignment problems to individual leaders first and later ensuring that the help is extended to all other team members through their leaders
- To boost the confidence level of each and every member of the team and appreciating the team work ability and cooperative and constructive learning styles.
- To design the rubrics used for evaluation of the activity for demonstrating the abilities as a leader as well a team member.
- To design assignment with problems well ahead of time and post them through Piazza on line tool.

The stepwise approach adopted for implementing the activity are discussed further

A. Problem identified:
Gathering the basic concepts of the course by solving problems on Analog & Digital Electronics using proposed PAL activity

B. Target group:
30% of students out of total intake are from Diploma background in Mechanical, Automobile & Mechatronics are the main target along with 20% of the lagging students from regular batch.

C. Strategy Adopted: Developing the foundation of the subject through problem solving in teams in a cooperative and constructive environment

D. Formation of Teams: Volunteered , confident and fast learner students are selected as leaders. Leaders to select the team members to form a group of their choice with mutual consent.

E. Design of the Activity:
- Conduction of meeting of team leaders with teacher on regularly. Clarification of doubts of individual leader by teacher in person.
- Design of assignments was done by teacher on every topic to promote problem solving ability Posting of assignment problems, study material, announcements through Piazza tool.
- Course teacher is involved in design of assignments using the available time and the student feedback.
- Enhanced interaction of teacher with the entire class of students by enabling transparency, and encouraging each of student to interact and do follow -up of the activity through Piazza
- Provision made for teacher to respond to students queries and doubts as when they are raised.
- Follow up of activity was done by Course teacher through the statistical analysis from piazza regarding the involvement of each and every student.

F. Assessment of Performance
PAL activity is made attractive, by assigning 40% weightage in Continuous Internal Evaluation process. Hence the CIE of the activity is further constituted by weightage on contribution on team work, problem solving and analysis, feedback from peer members of the team. Similarly, the rubric for each of the team members is based on the quality of submitted assignments, leader's feedback and problem solving analysis capability. Attributes used in rubrics also covered factors like team dynamism, leadership skills, cooperative learning etc.

III. RESULTS OF IMPLEMENTATION

As the PAL activity was managed by continuous monitoring, evaluation and feedback processes using Piazza tool, course instructor could predict the positive results of implementation. The same was evident through their intermediate test results of the current batch of students undergoing the course . The Feedback received from each member, gave inputs regarding the design of assignments on regular basis, which helped the refining of processes under PAL. The statistical data analysis done through Piazza was appreciated by students and teachers. Table 3.0 shows the compiled feedback received from students immediately after the Intermediate test. Students gave the positive feedback about the activity and agreed that it has helped them to boost their skill in problem solving , further improve performance in the tests apart from many other added advantages .

Feedback from team members about leaders and Leaders feedback about team performance constructively helped course instructor to clarify doubts and conflicts much easily and help the leaders of the teams to perform better. The Piazza tool helped the activity to gather feedback on regular basis and decide the corrective action as and when required. Course teacher was motivated by the way students have taken the activity in an optimistic way and participating.

Table 3.0 Feedback of students after implementation

Activity	Regular	Diploma based
Positive Feedback received through Piazza	80%	100%
Develops ability to solve assignments confidently and enhances problem solving ability	95%	90%
Increased confidence level and interaction with teachers	90%	100%
Positive Response of Students through Piazza	95%	100%
Can develop interpersonal skills	80%	75%
Sharing of knowledge and expertise extended to other subjects	50%	50%
Average Pass percentage		
Semester End Exam Average Pass percentage	80%	**Expected (95%)**

The performance effectiveness of the PAL activity is evident from the results of the Intermediate test performance also as tabulated in Table 4.0 as compared with that of previous batches. There is good boost in the pass percentage of students in the intermediate tests for the current batch up to 85% against 75% achieved for previous batches. This proved a very good motivation for teachers and students to take up the activity on regular basis through constant monitoring and achieve the target pass percentage to 95%.

One more important area to focus was to guide, monitor and help team leaders to emerge as great contributors of the activity. The success of PAL activity is mainly decided by the efforts put in by team leaders to help each of the team member to perform. Course teacher could attend to the problems faced by each leader and make them confident, on a regular basis. Regular interaction with teacher and rigorous problem solving with team members helped them perform very well in their tests. The feedback received from team members about the leader indicates that they have received very good support in developing their problem solving skills , providing them the moral support and encouragement, a important objective under the PAL activity under ADC course.

Even the evaluation of team leader's feedback was very important for the course teacher as the activity was an extra work for them, with the responsibility of the entire team's success. Through the questionnaire posted through Piazza, teacher could gather the feedback and compile it as shown in Table 5.0. On an average of 90% of leaders expressed their positive response towards the gains received from the activity.

Table5.0 Feedback from Team leaders on PAL

Factors	% of team leaders with positive response
Academic excellence through practice and clearing doubts of peers	100%
Enhanced interpersonal skills and conflict resolution	90%
Increased self esteem and responsibility	85%
Well received by team members hence team-lead ability	90%
Critical review of other's work and support with empathy	92%
Helps in social and employment situations	85%

The analysis of feedback and the results of tests proved motivation for the course teacher to take the Peer Assisted Learning Activity to a greater level with refined steps. The activity enabled the improvement of academic performance of students as evident from intermediate test result shown in Table 4.0. Thus it is hoped to achieve around 95% of pass percentage in the final exam result for the course in the current semester. Students got an opportunity to develop abilities like improved problem solving and analysis, interpersonal communication and team spirit etc through the activity. PAL is a very productive activity fostering cooperative and constructive environment. Thus the improved team dynamics encouraged students to have self organized PAL teams to work for other courses also. The course instructor is motivated to take up the activity for other mathematically intensive subjects to help students learn better with peer assistance.

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