

Check Solve Pass: A new technique for Student Centric Learning

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Abstract—Student Centric Learning experiences is always a challenge and important aspect of teaching pedagogy. It became more complex and challenging in current scenario of online teaching and learning. Amongst many innovative active learning methods, PBL: Problem based learning is majorly used in Engineering Education. Problem based learning, if worked as a group activity, each team member must actively contribute to ensure the learning objective which is a big problem. “Check Solve Pass” technique is a unique method proposed in this paper with the aim of motivating active contribution of each team member in Collaborative PBL. With the experimentation of this method, significant improvement in active participation of each group member is observed.

Keywords— “Check Solve Pass”, PBL, Active Learning, Collaborative Learning, Student Centric Learning

JEET Category—Practice

I. INTRODUCTION

With emphasis on Active learning, Problem Based Learning became very important and relevant in Engineering Education. Problem-based learning (PBL) is a student-centered approach where students learn the course by collaborative approach to find solution on problem in question. There are various learning outcomes [1-4] associated with Problem based learning namely team work, leadership skills, communication skills, critical thinking, knowledge application, multidisciplinary learning etc.

Various important aspects to Problem Based Learning are

- Student must define the objective of problem clearly
- Understand the scenario and knowledge to be applied
- Identify the new concepts, tools, techniques to be learned
- List various solutions to solve the problem
- Evaluate the various solutions and identify best optimal solution to problem
- Confirm and report the final solution of given problem

To achieve the mentioned learning objectives, teachers need to model the case in proper way. Fig.1 mention the steps that facilitators need to use to define PBL case in proper way.

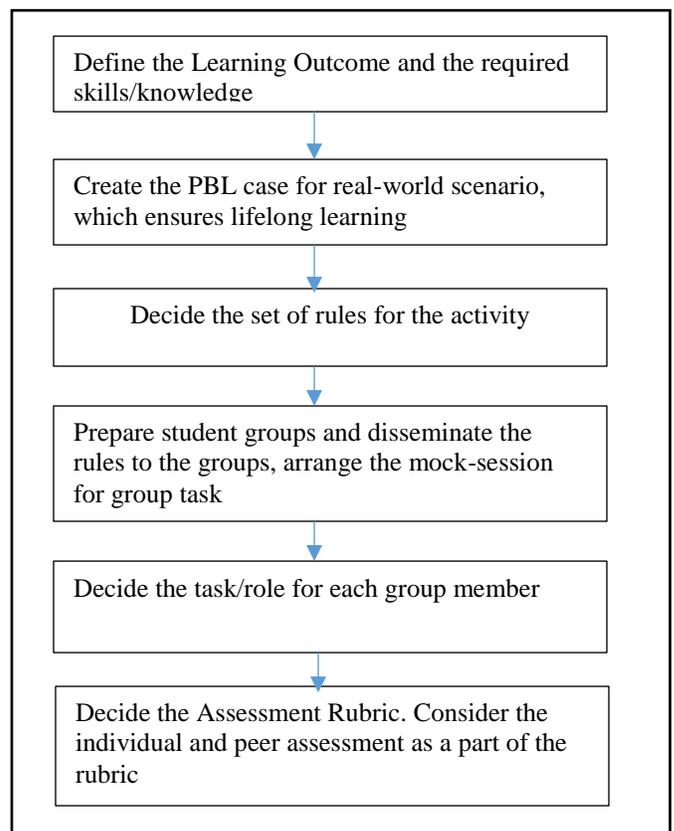


Fig. 1. PBL Preparation steps

As Shown in Fig.1, various steps need to follow, for successful execution of the PBL activity with the expected outcome.

Last step in the PBL is the crucial one, where the facilitator assesses the learning outcome of the individual and peers. Many a time, this phase may get impacted due to the more or fewer active members in the groups.

Assessment of the PBL is crucial [5-9], so need to be done with innovative method, so as to map the learning outcome of each member's participation in solving the activity and their ability for peer assessment is to be done.

We have proposed the unique method “Check Solve Pass” for PBL activity which ensures each member's participation in solving the activity and their ability for peer assessment.

In further sessions, the method is explained with case study and learning outcomes are discussed.

II. CHECK SOLVE PASS METHODOLOGY

“Check Solve Pass” method use the rotation approach for solving PBL activity. Steps for “Check Solve Pass” method is explained in Fig.2. PBL with Collaborative Learning is considered here. The “Check Solve Pass” methods starts with problem definition and dividing problem in equal parts, as no of students in the decided for the activity. Activity getting carried out by facilitator for Student groups.

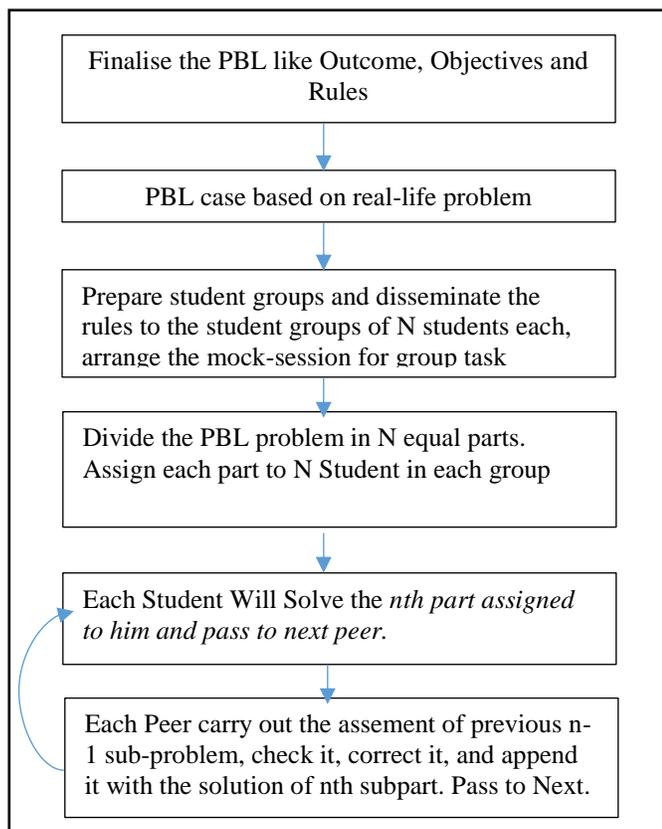


Fig. 2 “Check Solve Pass” Steps

As discussed in the Fig.2, “Check Solve Pass” Method with two actors: Facilitator and Students(group). Activities of each actor namely facilitator and students are mentioned here.

Facilitator Activities:

- PBL Case Preparation and Student Group formation.
- Divide the Problem in equal parts as per the student-group size. The sub-problems then assigned to each Group Member.

Student Activities:

- Check sub-problem of previously solved member,

- Correct the errors made by previous member, Solve the sub-problem of its own part, append it to solution
- Pass the solution to next member
- Repeat

Rubrics for assessment of this activity is mentioned in Table 1. Assessment Rubrics plays vital role in such kind of PBL activities. Good assessment rubrics enables facilitator to check and confirm contribution of the students in activity and provide genuine feedback on their performance in terms of marks to the students.

TABLE 1: ASSESSMENT RUBRICS FOR “CHECK SOLVE PASS”

Peer Assessment	Not Assessed [0]	Poor, Assessed but not corrected peer errors [2]	Good Assessed Partially and corrected few errors [3]	Excellent Assessed and Corrected all previous error [5]
Individual Task	No [0]	Wrongly solved Poor [2]	Solved with errors Good [3]	Correct Solution Excellent [5]
Team Work	Not attempted [0]	Attempted with errors [2]	Attempted but delayed submission [3]	Completed and Submitted within time [5]
Total of Individual	$Wt[Peer\ Assessment] + Wt[Individual\ Marks] + Wt[Team\ Work]$			

After using the assessment rubrics as mentioned in Table 1, it has been observed that most of the student became active and contributing on their part of the PBL in Check and Solve phase effectively. With such observation, following are the outcomes which are achieved using the “Check Solve Pass” technique, which are in the interest of student centric learning.

Outcomes:

- Problem solving
- Peer assessment
- Active involvement
- Collaborative Learning

In Check Phase, Students do the peer assessment, by applying their conceptual knowledge. Each student is also imparting their knowledge for solving their own assigned subtask which enables active involvement of the students. “Check Solve Pass” Method to be executed as group activity, which ensures the collaborative learning of the students.

III CASE STUDY OF CHECK SOLVE PASS WITH DECISION TREE

Case Study 1: Classification using Decision Tree

We experimented the “Check Solve Pass” Method to solve the Computer engineering problem: Decision Tree

Classification. It is one of the famous algorithms in Machine Learning. Classification using Decision Tree is the iterative and greedy algorithm. To understand Decision tree, the mathematics involved in the algorithm is important to know. This is repetitive and lengthy calculation involved in the algorithm. So, to make the Decision Tree Problem interesting, it is executed as Problem based learning conducted in Collaborative manner. To ensure that each students involvement in the activity, the PBL task is divided into N equal part. Where N is the group size.

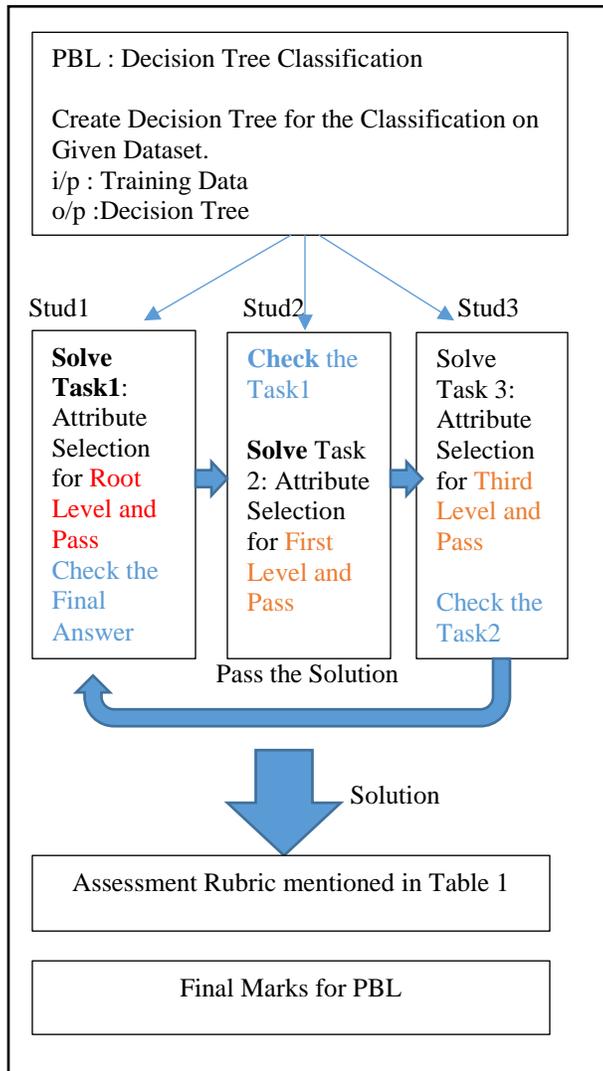


Fig.3 “Check Solve Pass” Example

As shown in Fig.3, Decision Tree PBL case first divided in 3 subtasks considering the Group of 3 Students. These subtasks then distributed amongst the students and asked to solve. First student solves its own part i.e., attribute selection for ROOT node of DT and pass the solution to next. Second Student, check the solution provided by first student, and assess it. Second student solve its part and append it with the solution. This appended solution is then passed to third student. Final solution will be assessed by the first student.

This way, every student will be responsible for solving of self-assigned a task and peer assessment.

Case Study: PageRank Algorithm

Google’s PageRank algorithm is important algorithm in Web Structure Mining.

PageRank is iterative algorithm with mathematical calculations involved. PBL with “Check Solve Pass” is applied for solving the PageRank as Active Learning Activity.

Step1: Facilitator Create PBL case for PageRank.

Step2: Facilitator decide the no of Iterations(N) and Create students’ groups of size as many iterations required(N)

Step3: Facilitator divide the PBL in N subparts distribute the subtask

Step4: First Student solve the PageRank for First Iteration using the learned knowledge and then pass the solution to next.

Step5: Second student check the solution provided by first one, solve the second iteration of PageRank and append the solution with first part.

Step 5: Step 4 repeated for rest of students

IV OBSERVATIONS AND OUTCOMES

PBL with “Check Solve Pass” is experimented in Online Mode of Active Learning Session. Students submitted their o/p through as images of solution.

With these two-case study, some of the student’s and facilitator’s observation are collected using Survey Form

TABLE 2: STUDENT’S SURVEY FOR “CHECK SOLVE PASS”

1	Do you find this activity interesting?	Yes/No
2	Do you feel, you can impart the learned knowledge in this activity?	Yes/No
3	Did you assess your Peer?	Yes/No
4	Have you benefited in clearing doubts while peer assessment?	Yes/No
5	Are you able to solve the task in given time?	Yes/No
6	Is the activity useful to understand complex problem?	Yes/No

TABLE 3: FACILITATOR’S SURVEY FOR “CHECK SOLVE PASS”

1	Are you able to conduct the activity in decided time duration?	Yes/No
2	Are all students engaged properly in active learning?	Yes/No
3	Is the assessment of PBL is feasible?	Yes/No
4	Are you able to assess peer assessment done by student?	Yes/No
5	Are you able to assess team work?	Yes/No
6	Are you able to assess task executed by individual?	Yes/No

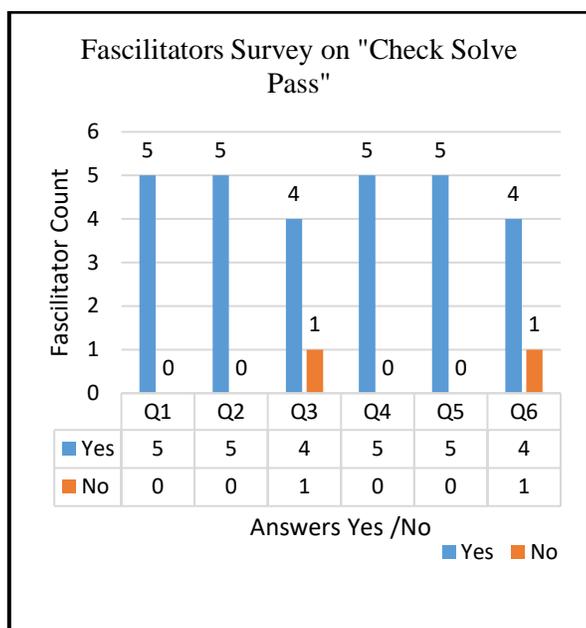


Fig.4 Facilitator’s Survey on “Check Solve Pass”

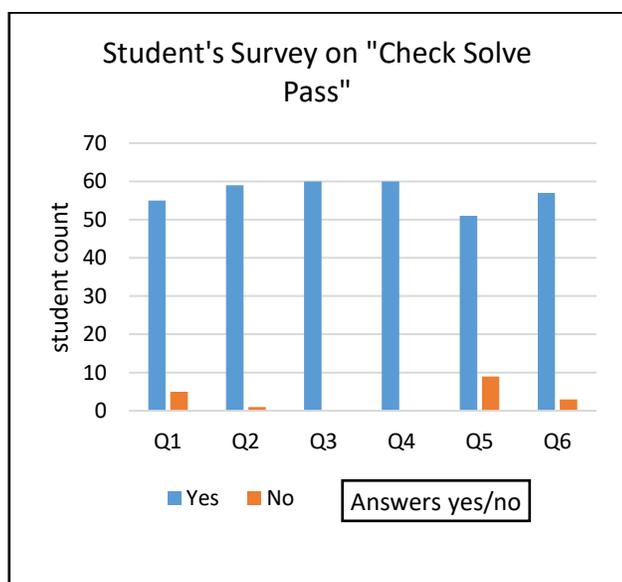


Fig.5 Student’s Survey on “Check Solve Pass”

These observations are collected from class of 60 students and 5 facilitators. It is observed in chart shown fig 4 that most of the student’s are satisfied about their learning, peer assessment and found the activity interesting.

Facilitator’ observation is shown in fig.4. It is observed that, most of the facilitator found this method suitable for complex problem solving. Time constraints are observed as an issue while executing “Check Solve Pass” method.

V CONCLUSION AND FUTURE SCOPE

With “Check Solve Pass” method of PBL complex problems can be carried out as interesting active learning assessment. It is observed that “Check Solve Pass” method is able to fill the

gap of PBL activity by providing effective peer assessment and individual contribution assessment tools. As per the survey taken from students and facilitator, this method faces the issue of “Time Constraint” which can be tackled by proving optimal time for the students. “Check Solve Pass” method is easy to implement but observed as time consuming because of the initial stages of PBL design and assigning. Advantage of this method is that it is helpful in teaching many of engineering algorithm which are iterative and complex in nature with lots of computation involved. To prove the success of this method hypothesis testing can be used on some sample data and results can be stated. Also, this method can be used in two modes as In-class Activity or Out-Class Activity. Success of both methods can be compared further by checking facilitator and student’s survey.

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