Section A-Research paper

IMPLEMENTATION OF INNOVATIVE TEACHING TECHNIQUES FOR BETTER LEARNING AND UNDERSTANDING OF UNDERGRADUATE ENGINEERING STUDENTS

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In this paper, an effort to involve students of undergraduate Electronics (Instrumentation & Control) engineering has been made. The learning and understanding of any undergraduate student is very important as they are going to implement the knowledge attained during their four-year engineering programme in their professional career and to achieve heights. The conventional methodologies of teaching need some creative and innovative ways of making them understand whatever course is being taught to them. In the course of 'Digital Signal Processing and Applications' a sample group of 25 students was considered as a case study to apply the innovative technique of sharing the knowledge gained through use of available resources like internet, books, research articles, peer learning and classroom teaching. The methodology of think pair and share through which they help each other to learn and understand has shown certain innovations. Think pair and share technique has shown an improvement in attendance and performance in end semester examination as well. In this work, it is proved that innovative ways of teaching, adopted by teacher in the classroom, increases the interest of students in learning as well.

1. Introduction

One of the important factors that makes a nation is education. The education imparts knowledge, develops moral values and creates awareness among its society. The education system of a country plays an important role in engaging and imparting knowledge among its people. Almost all the developed and developing countries are spending a huge amount in improving the infrastructure of its education system. Although infrastructure plays an important role in improving the education system but if the teaching and learning process is not appropriate, there is no use of spending a huge amount on infrastructure.

The teaching and learning process decides the ability of a student to understand a particular concept in the class. Various innovative teaching and learning methodologies have been discussed in the literature by different academicians [1-2]. In conventional teaching methodologies where the teacher delivers a lecture on a particular topic for around 40 to 50 minutes and thereafter gives opportunity to the students to raise questions, most of the students are unable to ask any question. Only a few intelligent students and who are not shy participate a little bit in the discussion. Hence, the conventional teaching and learning process seems to be ineffective for a group of students who are weak in studies or a particular subject but feel shy in getting up and discussing their doubts in front of bigger group of students. Also, there might be a time constraint from the deliverer end due to which the teaching and learning process does not comes out to be fruitful and remains single ended. The authors were motivated to try some new innovative technology in a smaller group of students.

This paper presents a case study regarding the implementation of an innovative cooperative teaching and learning model known as Think Pair Share (TPS) in one of the undergraduate courses being taught in Thapar Institute of Engineering and Technology, India.

This paper is divided into three sections. Introduction to teaching and learning process is represented in Section 1. Section 2 focusses on TPS methodology. A case study on the implementation of TPS in an undergraduate class of 25 students is discussed in Section 3. Finally, the paper is concluded with the findings of case study followed by references.

2. Think Pair Share: An Innovative way of Teaching and Learning

Think pair share was first introduced by Lyman in the year 1981 [3-4]. It is a cooperative teaching and learning methodology where a student is given a problem by the respective instructor. Firstly, the student thinks about the solution of a problem in a limited period of time. After each student comes up with a solution, the students are paired in groups. Finally, the solution generated by the student is discussed with peers of that group or other groups. The TPS methodology strengthens the communication skills of the student. Every student has a chance to express and contribute his own views which ends in many positive effects on the complete group. The students feel more self-confident and more dynamic in the class because now they have a chance to actively participate in the discussion which they were not able to do in larger groups. Moreover, the students listen to each other's point of view and respect the ideas and thoughts of peers and learn much more than reading from the books. Working in groups also reduces stress and awkwardness. If the answer is wrong, they won't feel shy because of the backing up of a whole group.

The advantages of TPS can be listed below [5]:

a) It increases the level of classroom engagement
b) Helps the weak and shy students to participate in the class room activities
c) Students come out with different ideas when they discuss the solution with peers
d) Class room becomes more friendly
e) While pairing, the weaker students can be paired with intelligent ones. It increases

the level of confidence among weak students

f) The students learn peer evaluation

3. Case Study

This section represents a case study in which a class of 25 students of an undergraduate engineering course was being taught to the students of Electronics Instrumentation and Control at TIET, Patiala. This research is intended to measure the impact of TPS on improving students cognitive and academic performance.

The TPS teaching and learning methodology was implemented by the course instructor for the course Digital Signal Processing and Applications(UEI-607). The course instructor shifted from the conventional mode of teaching after conduction of mid semester test towards cooperative TPS methodology.

The course scheme constituted three lectures and one tutorial class in a week for this particular course. This methodology was implemented in each of the tutorial class consisting maximum of 25 students each. This mathematical course had more of numericals and this mathematics needed a lot of practise. The numerical problems were given by the course instructor to the students in the class and a fixed time was given to them to think about the solution. The students came out with different solutions. Thereafter, the students were paired in groups and they shared their ideas with each other and finally the whole group discussed the whole problem with the course instructor.

The findings of the case study were as follows:

(i) The course instructor observed that after implementation of TPS methodology the engagement of the students in the class increased as compared to before the mid-semester test.

(ii) The average attendance in the class increased by 8.5% after implementation of TPS as shown in Figure 1.

(iii) The weak and shy students started working in groups with intelligent students and came out with better understanding of the topic.

(iv) The students started thinking ‘out of the box solution’.

(v) The most important of implementing this technique was that the performance of the students in the end semester examination boosted with an increase in overall average of the class by 7.25% as shown in Figure 2.

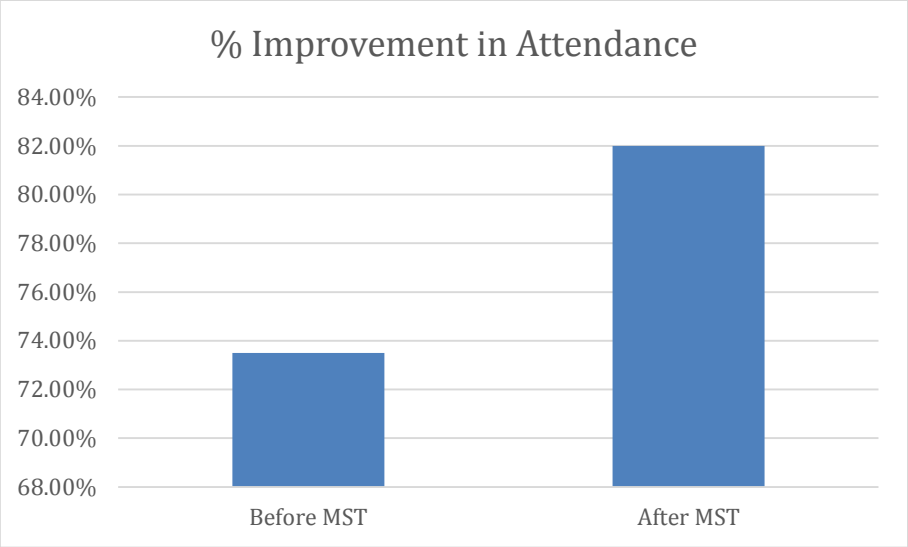

Figure 2: Percentage improvement in average class attendance before and after MST

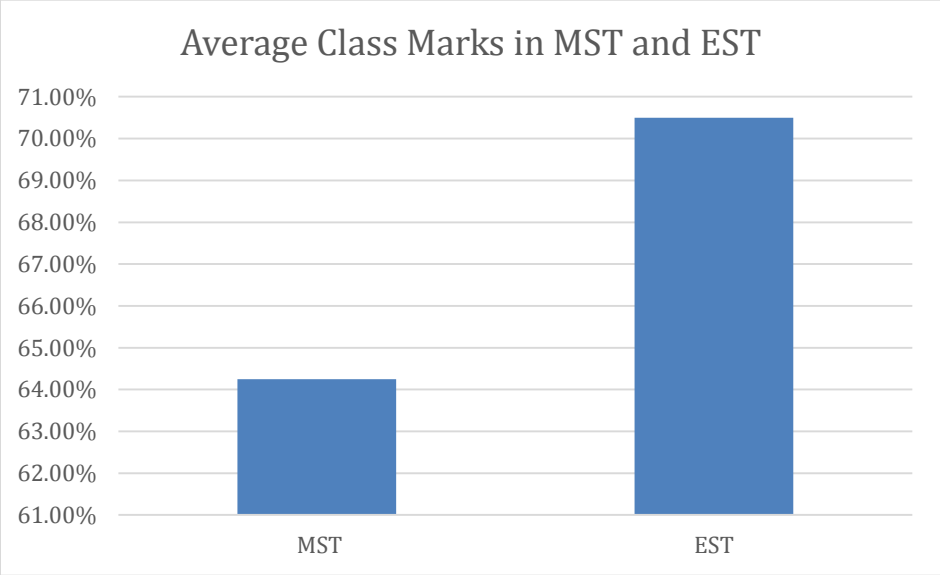

Figure 3: Percentage improvement in average class marks

Conclusion

This paper focused on the advantages of applying an innovative teaching and learning methodology known as Think Pair Share in a small group of students. A case study has been presented which showed that after implementation of TPS, the performance of the students improved a lot specially, the weak and shy students in terms of their participation in the class and marks in the end semester test. Furthermore, with the implementation of TPS methodology, there was an improvement in the class attendance also which proved the effectiveness of the teaching and learning process.

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