

Studying the Effectiveness of Peer Instruction in Statics

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Abstract

This paper describes the peer instruction approach that was used in teaching Statics. The subject of Statics lays the foundation for subsequent courses, namely Dynamics and Mechanics of materials. Hence it becomes critical for any engineering student to understand and grasp the concepts of Statics course as it gives the students an ability to master follow-up material in upper level engineering courses. Therefore, improving learning in the subject of Engineering Statics deserves significant attention. Research shows that students who are actively engaged in learning, learn more. It was also proved that traditionally taught courses do little to improve student's understanding of the key concepts and motivate only a few students in class. It is believed that peer instruction is an effective way to motivate students by making them teach their fellow students. This approach not only helps students learn core concepts and present it in technical language but also build their confidence. Results of this study indicated that post quiz scores improved for 71% of the students and 15% of students' scores were 100 in both pre and post quizzes. The overall pass rate was 79% on quizzes and 79% on the final exam.

1. Introduction

Students, who are actively engaged in learning, learn more [1, 2]. The purpose of a think-pair-share activity is to put the teaching and learning into the hands of the students. Research has shown that student-led reflection and organized discussion will lead to greater learning outcomes than simply listening to the instructor [3]. It is an effective method that uses interactive techniques to improve education and retain knowledge. National Training Laboratory study indicated that learners retain about 90% of what they learn when they teach someone else when compared to retention using methods such as practices, discussion, demonstration, reading, and lectures [4]. Interactive techniques such as these provide students with a greater range of learning styles, as compared with only traditional lecture.

2. Student Teams

The class had fourteen actively participating (absence less than 10%) students. An informal pairing method [2]

was followed. It was interesting to observe that students formed teams naturally by their own accord on day one and continued in the same teams through out the semester. However, a recommendation and an opportunity was given to them to change teams after two quizzes. It was observed that the students were reluctant to change their teams as some students did not seem to be concerned about their team members, and the remaining students already formed teams with their friend(s) on day one. They were four teams that had two students each and two teams had three students each.

3. Methodology

The concepts of Statics were taught during the first 20-25 minutes of the class with an example done on the board. Four topics; forces in equilibrium, moment, Trusses and Moment of Inertia were taught using peer instruction method. Students were asked to take a pre-quiz/in-class assignment on conceptual questions before solving problems. Sometimes, conceptual questions were shown on a power-point presentation and all the students were asked to answer them orally. Although this was a time consuming process, it created a learning environment that led to in-class discussions which helped students overcome their confusion or misconceptions on the topic(s) learned. They eventually were able to successfully solve the problem(s) by taking turns in explaining the concepts and problem solving techniques.

3.1 Evaluation Results and Conclusions

Four teams enjoyed working together and were able to complete the problems in a timely fashion. For such teams, their performance during the pre and post quizzes/in-class assignments improved by approximately 5-10%.

Three teams struggled during the class understanding the concepts and required instructor's help in explaining the concepts again. Two of these three teams had one student perform better than the other, which could be again due to lack of understanding of the concepts, or peer instruction being not effective or lack of active participation.

Figure 1 shows the pre and post scores of each team member.

Overall, students answered 'Yes' to the survey question, "was peer instruction helpful in learning topics?".

Students also expressed their liking towards the methodology of how the class was taught.

4. Summary

Results indicated that post quiz scores improved for 71% of the students and 15% of students' scores were 100 in both pre and post quizzes. The overall pass rate was 79% on quizzes and 79% on the final exam. Post quiz scores clearly indicated that most of the students benefited from peer instruction. In future, more topics will be taught using this approach and the students will be tested on topics learned with and without the peer instruction method in addition to quizzes.

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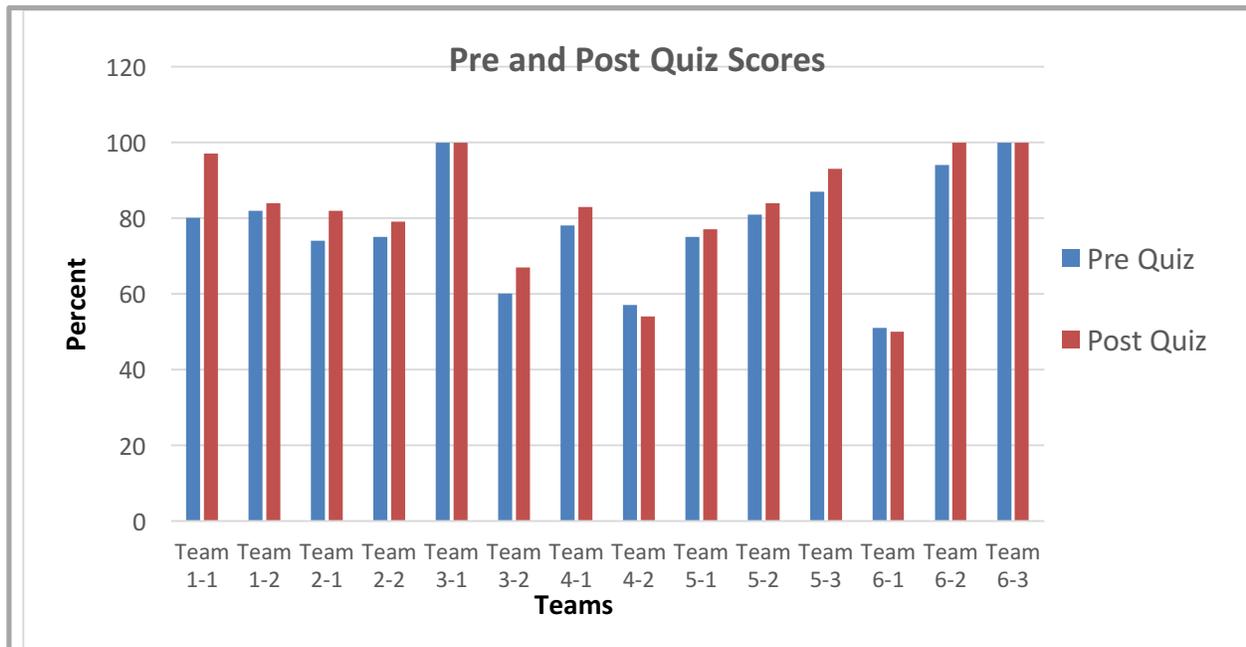


Fig. 1 Pre and Post Quiz scores