Successful Implementation of Peer Led Team Learning for Statics and Strength of Materials

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Abstract

Peer Led Team Learning (PLTL) involves students working in small groups under the guidance of a Peer leader. Peer Leaders are current students who have successfully completed the course. The goal of PLTL is to enable students to gain confidence and critical problem solving skills that will help them master the course content thereby improving their ability to succeed in successive design courses. Civil Engineering Technology (Civil) and Construction Management (CM) students are required to complete Statics and Strength of Materials as a prerequisite to Steel and Concrete Design courses. Performance in Statics is indicative of performance in the design course sequence and Statics is particularly challenging for students entering the program at a remedial level of math. A large number of students transfer out of the Civil and CM majors after the first semester. PLTL has been implemented in Statics in an effort to improve student performance in the course and throughout completion of the degree. PLTL is currently in its second semester of implementation and data indicates that the students in the PLTL inclusive Statics classes are performing better than those in sections without PLTL.

Introduction

The Department of Construction Management and Civil Engineering Technology (CMCE) of New York City College of Technology (City Tech) offers associate degree programs in Civil Engineering Technology (CV) and Construction Management Technology (CM). All incoming students are required to take the CUNY Skills Assessment Tests in reading, writing, and mathematics. Students who have not placed in the appropriate math levels for the major will be required to complete remedial courses. Students in remedial courses are permitted to enroll in an associate degree program but must demonstrate competency in reading, writing, and mathematics prior to the completion of 12 credits.

Math requirements for the CMCE programs are College Algebra, Trigonometry, PreCalculus, and Calculus. The CMCE Curriculum includes Statics and Strength of Materials 1 and 2 taken in the first and second semesters, and Elements of Structural Design for Steel and Concrete taken in the third and fourth semester. Statics and Strength of Materials 1, CMCE1104, provides an introduction to the basic theory necessary for structural analysis and design, including the concepts of force, stress, strain and equilibrium. Statics and Strength of Materials 2, CMCE1204, covers engineering concepts of shear and bending moment diagrams, section properties, beam analysis, and truss analysis (College Catalog, 2011-2013). The concepts covered in CMCE 1104 and CMCE 1204 are critical in the design of structures; therefore, these courses must be successfully completed before a student enrolls in design courses.

Student performance in 1104 is directly related to performance in 1204 and subsequently in Steel and Concrete Design. Knowledge of College Algebra and Trigonometry is critical to success in these courses. Over the past decade, about 40% of first-time freshman failed the

CUNY Math Placement Exam upon enrollment (Assessment and Institutional Research [AIR], 2012). Students enroll without competency in college level math. As discussed, students who have failed the placement exam may enroll in the CMCE curriculum but are required to complete remedial courses. Grade distributions in the department over the past decade indicate that only about 53% of students pass 1104 with a grade of C or better; about 62% of students pass 1204 with a grade of C or better. One-Year Retention Rates of First-time, Full-time, Degree-seeking freshman dropped from 60% in 2008 to 37% in 2010 for the CV major and from 50% in 2008 to 36% in 2010 for the CM major (AIR, 2012). Poor performance in 1104 and struggles with math are contributing factors to students leaving the CMCE program.

The department has made efforts to turn around the retention rates and improve student performance. It has converted 1275 to a prerequisite instead of co-requisite, implemented a minimum grade of a C or better in 1275 and 1104, and implemented Peer Led Team Learning in one section of 1104.

Peer Led Team Learning is an innovative learning technique whereby students participate in weekly workshops. Workshop modules are created by faculty and consist of challenging problems based on the weekly lectures. Workshops consist of students working in small groups under the guidance of a Peer Leader to complete the modules. Successful implementation of PLTL requires active participation of the faculty, students, and peer leaders (Roth, Goldstein, & Marcus, 2001).

Faculty incorporating PLTL must commit to restructuring their class syllabus and notes to include the workshops as part of the course. Participation in the workshops should be mandatory and should also be a contributing factor to the student grade in order to encourage full participation. Faculty must develop challenging workshop modules which reflect the lecture

topic; students should have the tools to solve the problems but be forced to step outside of their comfort zone.

Peer leaders are students who have successfully completed the course and have decided to take on a mentoring role for their peers. At City Tech, Peer Leaders complete a one credit course in Peer Leader Training as well as attending weekly leadership seminars. Peer leaders learn to lead a group of students by focusing on communication, group dynamics, motivation, learning styles, and other process issues in order to help participants actively engage with course material (College Catalog, 2011-2013).

Group dynamics evolves, throughout the semester, from a reserved group of strangers to a team of peers. As the semester proceeds, students develop confidence in themselves and their peers. Every student has something valuable to contribute to the group and students of all skill levels are involved. Once a student has mastered a subject they remain involved by taking on a leadership role and helping their peers. Students who may be struggling will develop a comfort level within their team and depend on their peers for guidance.

Method

PLTL was implemented in CMCE 1104 Section 9002 in the spring of 2012; CMCE 1104 Section 9000 served as the Control. The PLTL section was offered on Tuesday mornings from 10-11:40AM. Twenty Nine students enrolled and twenty students completed the course. The Control section was offered on Thursday mornings from 10-11:40AM. Thirty students enrolled and twenty students completed the course. A pre-assessment survey was completed by both sections and the results indicate that there was a uniform level of knowledge in college math among the students.

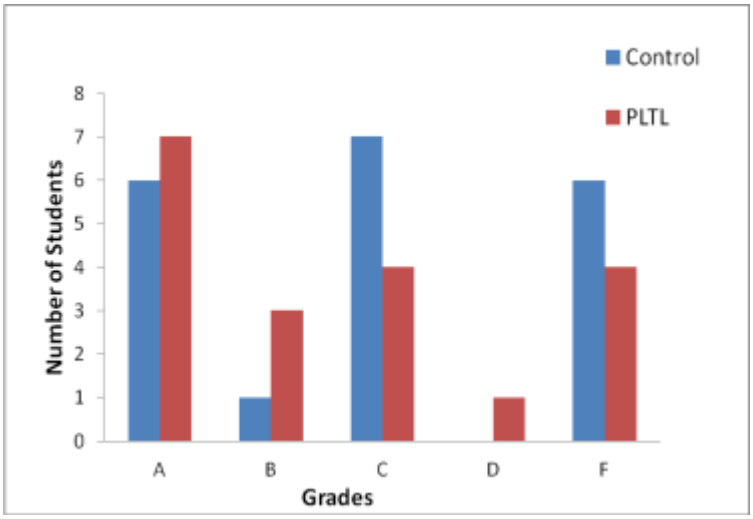
Demographics

The sections in the study include students enrolled in CV and CM majors. In the spring 2012, the student profile for CMCE students was about 46% enrolled Part Time, about 53 % enrolled Full Time; about 10% Female, about 90% Male. The breakdown by race for Sections 9000 and 9002 were 28.6% Asian or Pacific Islander, 28.6% Black, 19.6% Hispanic, and 23.2% White (AIR, 2012).

Results

The grade distribution for the PLTL Section and the Control Section is shown in Figure 1. The final grade average for students in the PLTL section was 78.9 or a C+ as opposed to 72.6 or a C for the Control Group. PLTL student participants completed a pre and post survey which reflects their confidence level in the class. Overall, the students in the PLTL section developed a sense of confidence in their ability to understand the course material and performed better than those in the Control section.

Figure 1: Grade Distribution Spring 2012



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