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**STRENGTHENING FOUNDATIONAL MATHEMATICS COURSES THROUGH THE  
IMPLEMENTATION OF PEER-LED WORKSHOPS**

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The consistent low pass rates of undergraduate students taking entry level mathematics courses are a national trend. Many students are entering college deficient in the necessary quantitative skills needed to fulfill their mathematics requirements for their majors. To address this dire concern, the Peer-Led Team Learning (PLTL) instructional model was adopted by New York City College of Technology to increase the retention, persistence, and pass rates in two fundamental mathematics courses (MAT 1175: Fundamentals of Mathematics and MAT 1275: College Algebra and Trigonometry). The results from this study showed that this pedagogical paradigm of student engagement is effective in promoting success in these gatekeeper courses.

Introduction

Developmental mathematics in higher education continues to be a national challenge in the United States. In response to this problem, improvement initiatives are being implemented especially at the community colleges where remediation in mathematics is prevalent (Bahr, 2013; Bonham & Boylan, 2011; Cullinane & Treisman, 2010). Even in a comprehensive college, undergraduates do not perform well in foundational mathematics courses, and the pass rates for these courses are just as dismal. At New York City College of Technology (City Tech), MAT 1175: Fundamentals of Mathematics and MAT 1275: Intermediate Algebra and Trigonometry are offered as credit-bearing courses. MAT 1175 covers topics in algebra and geometry, and MAT 1275 reviews concepts in algebra and introduces topics in trigonometry. For the past ten years, the institution has reported a dismal average pass rate of approximately 50% for both courses. Because of this dire trend, the administration has been supportive in seeking and implementing new modes of instruction to improve these passrates. Thus, the Peer-Led Team Learning (PLTL) instructional model has been established as one of the interventions to assist in increasing the pass rates for these courses.

At City Tech, there are special PLTL sections for MAT 1175 and MAT 1275 offered every semester. These courses are four credits each with an additional one-hour peer-led session embedded in the course. An average of four Peer Leaders would facilitate the session for a class of approximately 35 students. Each group, comprise of 8-10 students, would work on challenging modules with problems sets that reflect the departmental mathematics final exam. The group meets 14 times during the semester.

### Sample

Participants enrolled in the PLTL sections for MAT 1175 and MAT 1275 were selected for this study. In Fall 2012, there were two sections of MAT 1175 and one section of MAT 1275. In Spring 2013, there were also two sections of MAT 1175 and MAT 1275. Students either self-selected into the extra one hour peer-led section or they enrolled in the course without realizing the extra mandatory session. There were a total of 138 and 110 students in the PLTL sections of MAT 1175 and MAT 1275, respectively, during the 2012-2013 academic year.

### Methodology

On the first day of class, the class was informed of the additional hour mandated for peer-led workshop. Students had the option of transferring out of the course during the first week of class, especially those students who were unaware of the additional mandatory one-hour workshop attached to the course. Approximately eight to ten students were grouped randomly. A Peer Leader would meet with the group once a week for 14 weeks to work on carefully selected problems. At the end of the Fall 2012 and Spring 2013 semesters, the course grade for each student was recorded and compared with the institutional data.

### Results

Courses with a mandatory PLTL one-hour per week workshop sessions had an average 17.1% increase in ABC pass rates and a 12.0% increase in ABCD pass rates than non-PLTL sections for MAT 1175 (Fundamentals of Mathematics). Furthermore, PLTL sections had an average 20.4% increase in ABC pass rates and 14.4% increase in ABCD pass rates than non-PLTL sections for MAT 1275 (College Algebra and Trigonometry). There was an 8.5% decrease in withdrawal rates for the MAT 1175 PLTL sections and a 5% decrease for the MAT 1275 PLTL sections. Table 1 summarizes the results.

Table 1: Grade Distribution of MAT 1175 and MAT 1275 With and Without PLTL Workshops

Grade	PLTL SECTIONS FALL 2012 and Spring 2013		INSTITUTIONAL DATA SPRING 2012	
	PLTL MAT 1175 (n=138)	PLTL MAT 1275 (n=110)	MAT 1175 Final Grade Distribution (n=1309)	MAT 1275 Final Grade Distribution (n=1355)
Pass Rates (ABC)	55.8% (77)	70.9% (78)	38.7%	50.5%
Pass Rates (ABCD)	65.9% (91)	78.2% (86)	53.9%	63.8%
Withdraw	16.7 % (23)	12.7% (14)	25.2%	17.6%
Fail	17.4% (24)	8.2% (9)	19.9%	16.6%
Incomplete	0.0% (0)	0.9% (1)	0.9%	1.9%

### Conclusion

The PLTL sections of two foundational mathematics courses have resulted in higher pass rates and lower withdrawal rates. Although an argument can be made that an additional structured one-hour of instruction may contribute to the positive outcomes, it is highly recommended that future programs should carefully plan a randomly designed study. A comparison group should be intentionally incorporated in the project, and the instructors for the mathematics classes should also be controlled for. Therefore, statistical analysis can be used to determine if there are any significant differences between the two groups.

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