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**Implementation of PLTL in a Freshman Biology Course at
The University of Houston-Downtown**
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Abstract

At the University of Houston-Downtown, we take pride in providing students with a faculty-intensive approach to high quality higher education in science, technology, engineering, and mathematics (STEM). As part of an UHD initiative to improve student retention and performance, we started a project to implement PLTL workshops within one freshman General Biology I course. Here, we present our initial efforts in this project and preliminary data on its effectiveness beginning in the Spring 2011 Semester. According to our data, there was an increased performance (20%) among the students who attended workshops compared to the class average and a decrease (20%) in withdrawal and failing. However, we also faced challenges in certain areas such as the lack of biology peer leaders. We will discuss these issues and the strategies we took to address them.

The University of Houston-Downtown is a Hispanic and minority serving open admission institution, which serves a diverse student body that differs in cultural, educational and economic background. According to our mission statement, "UHD will be a premier city university providing high-impact experiences and 21st Century skills to every student." We must recognize the gap generated by our diversity, especially in the readiness for college among our students. For freshman General Biology I courses, there is a relatively high failure rate (52-55% for D, W or F over 2006-2011) because students are either unprepared or do not spend enough time studying. When they do, the study may be inefficient due to their poor study skills. For our institution, the low success rate (45-48%) correlates to retention of freshman students and affects graduation rate indirectly.

To improve student performance in General Biology I, we not only need to search for the appropriate best practice but also to implement strategies that support and enhance student learning outside classrooms; aim to resolve conceptual problems students encounter; and immerse them in a positive supportive environment. The Peer Led Team Learning (PLTL) is a strategy that has shown promising results in freshman level courses across disciplines (Eberlein et al., 2008). One successful example is within our own university in the Department of Computer and Mathematical Sciences (CMS) which has incorporated PLTL in its Algebra courses. This program led by Ms. Mitsue Nakamura incorporates PLTL methodology in the core curriculum and provides vertical high impact for students, starting from training peer leaders to placing them in workshops available to all students who may become peer leaders in the future.

First proposed by Gosser et al., there are six critical components vital to the successful implementation of PLTL methodology (2001). (1) Workshops have to be closely integrated with the course. (2) The teaching faculty is active in all aspects of the workshops. (3) Peer leaders have to be knowledgeable in the discipline as well as being familiar with PLTL pedagogies. (4) Workshop problems must be appropriately

challenging and designed for collaborative learning. (5) Organizational arrangements must promote active learning. (6) Institutional and departmental support of innovative teaching methods is necessary. We designed the program based on these six critical components as follows.

Besides attending lectures, a total of 19 students enrolled in General Biology I in Spring 2011 attended weekly workshop sessions each lasting for two hours. A series of topics were covered and workshop materials were either published or written by the faculty member who was teaching the course (Griswold et al., 2012, Lowell et al., 2012, Stetler et al., 2012, McDaniel, 2012). Weekly meetings were held between the peer leader and the faculty to discuss workshop content and exchange feedback on the effectiveness of the sessions. Therefore, the first two critical components were included. In Spring, we had one peer leader who majored in biology and started as a peer leader in the CMS PLTL program, which has had lots of experience and success training peer leaders. The third critical component has thus been satisfied. To meet the fourth critical component, we used a combination of published PLTL material and our own worksheets, carefully designed to suit the level of difficulty of the course and our student's abilities. They were evaluated and adjusted weekly based on the lecture schedule and feedbacks from the peer leader. Lastly, we gained financial and institutional support from the UHD administration that provides stipends for peer leaders and a space where workshops can take place. The fifth and sixth critical components were also in place.

The 19 students who attended the workshops were split into two groups of 8-10 people in each session and used the same materials under the same peer leader. Each workshop session lasted for two hours and focused on the topic that was recently covered in class prior to each exam (Table 1). This group of students performed better compared to the class average (Table 1). There was a 20% increase in C and above (> C) and a drop in withdrawal (W) and failure (F) by a total of 20%. The apparent increase in the student performance was further supported by student positive feedback suggesting a high level of confidence and motivation.

Table 1: The grade distribution of General Biology I students who attended biology PLTL workshops. The percentage differences between these students and the class are indicated as an increase or decrease. The percentage of D was unchanged, therefore not shown here.

Sample (No.)	> C (%)	F or W (%)
Class (79)	0.43	0.41
PLTL participants (19)	0.632	0.21
Change	0.20	-0.20

It did not surprise us that students who attended the workshops did better on average than the class average. However, other factors may have contributed to the difference. One can argue that the students who attended workshops may be stronger in their academic skills or more motivated which implies that they would have performed better with or without the workshops. We do not have data to compare the GPAs of all students prior to attending this course therefore it is difficult to disprove this possibility. However, part of our data suggested that at least this possibility was not entirely responsible. For instance, 4 out of 19 students who attended the workshops either failed or withdrew, suggesting that the workshop participants seemed to include students of all levels. On the other hand, among the students who received a C or above, 22 out of 79 students did not attend the workshops in contrast to the 12 students who did. This suggested that a significant portion of stronger students did not attend workshops. Therefore, the alternative explanation is

that, depending on their learning styles, students chose to attend workshops whereas some others may be able to succeed without attending. In this case, PLTL workshops provided a platform for those who are collaborative learners rather than independent learners.

Hence, it is important to acknowledge that our work and data were preliminary. The student sample size was small and the effectiveness of this effort was hard to assess as we lacked appropriate controls. We faced several challenges when trying to implement PLTL workshops including resistance from students to invest additional time outside class periods as our students are often over-committed. The existing materials need improvement and evaluation which will be expedited as individual practitioners publish their work and exchange resources. To address some of these issues, we have begun to expand the program.

We started by recruiting biology students to become PLTL workshop leaders. The goal is to provide enough sessions that can accommodate all students from the class. After a review of applicants, four biology students were selected to receive training in the Spring of 2012. Two have completed the training and received the certification to lead workshops in the Fall of 2012 and the Spring of 2013. This phase of the program is still in progress and we hope that with enough trained peer leaders and by making them mandatory, the workshops can make a maximum impact on the students who take this class. Lastly, we propose to implement a standardized tool to compare between sessions to assess the effectiveness of peer-led team learning.

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