What is PLTL?
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The traditional lecture model is efficient at transmitting content but does not provide the many experiences essential for learning: the freedom to discuss and debate science concepts in a challenging but non-threatening environment, the connection to mentors and the power of working in a team. It is important, therefore, that the design of the instructional environment includes opportunities for students to learn from each other, to communicate with each other and other scientists in the language of science and to explain science concepts to non-scientists. In addition, the students must develop confidence in their own abilities to become productive members of society. Providing appropriate role models is essential. While this type of instructional design is good for all students, studies have shown that it is especially beneficial for women and underrepresented groups.

Many urban universities have a diverse student body that consists of traditional age students, returning students, and transfer students with varied academic backgrounds. Many of these students are first generation college students who may lack role models and appropriate mentors. Many of these students also hold full time jobs and for others English is a second language. All of these factors contribute to the difficulties students face in becoming a part of a community that engages in teaching and learning.

The Peer-Led Team Learning (PLTL) is a proven model that addresses the needs of traditional and non-traditional students. Peer-Led workshops are an effective way to engage large numbers of students with course material and each other. Improved performance and retention, development of communication and team skills, higher motivation and course satisfaction, and increased interest in pursuing further study in science are among the benefits of the PLTL approach.

Traditional instruction in introductory science courses relies primarily on the lecture, a method of presentation and demonstration by an expert to a group of listeners. Although many good purposes are served by the lecture/recitation method, it has its limitations that are directly related to the lack of student involvement. The PLTL model preserves the lecture and introduces a new structure, a weekly two-hour workshop, where six to eight students work as a team to solve carefully structured problems under the guidance of a peer leader.

The peer leader clarifies goals, ensures that team members engage with the materials and with each other, builds commitment and confidence, and encourages debate and discussion. A good peer leader liberates students to take responsibility for their own learning and forces their efforts to negotiate meaning and constructing individual understanding. One student commented, “When I take an exam now, I hear my workshop colleagues asking, “How do you know? Are you sure? Can you explain?” Other students have noted “We would never go on to another problem until everybody understood what was happening, and I think that one of the best things about the workshops is that it wasn’t the workshop leader that was in charge of everything that was going on. It was each of us, if we knew what was going on, each of us would take a turn to explain to the other people what we thought or how we solved the problems.”

Peer leaders serve as role models. They are selected because they have recently completed the course, have done well and demonstrate good communication and leadership skills. They are enthusiastic and motivated and have the desire to contribute to the learning of their peers. They are catalysts in forming a community of students that can serve as a support group for each other beyond the life of the course. With time the peer leaders become increasingly independent at performing these tasks and often become interested in taking on other leadership roles or become interested in pursuing careers that involve teaching and research. One former leader now working as a teacher noted “As a teacher at times I find myself dictating information to students. However I remember from being a leader how discussions and leading students towards conclusions is a great benefit to them.” Recent research findings (Gafney & Varma-Nelson, 2002; Tenney & Houck, 2004) point to the following gains when students take on the role as peer leaders:

- Increased content knowledge and better success in higher-level science courses.
- Increased confidence to pursue science-related careers.
- An appreciation for different learning styles.
- Improved "people skills" and collegial relationship with the course instructor.

Appropriate materials are important for the success of the workshop. Each weekly workshop unit is built around a set of problems and activities designed by the faculty member to focus on central ideas to help the students attain course goals. The workshops invite students to work together to model effective problem-solving tactics. Solutions to the problems are not provided in an answer ke*y* because having the answers short-circuits the discussion and collaboration among students. Working to the answer key develops the misconception (among students) that scientific problems have one correct answer. This mechanism of constructing and selecting the best answer is the way students build confidence in their own ability to grapple with difficult scientific concepts and models the way scientists arrive at the answers to research problems. The students develop the creativity and the confidence to become better problem solvers.

Several years of new adoptions and evaluations have demonstrated that the following six components are indispensable to successful implementation of PLTL. If one is missing, the PLTL workshops are not as effective as they might be:

- The workshop is integral to the course
- Course professors are involved in the selection of materials, training and supervision of peer leaders, and they review the progress of workshops
- Peer Leaders are selected, trained and supervised to be skilled in group work as facilitators
- Workshop materials are appropriately challenging, directly related to course material and designed for small group work
- The Workshops are held once a week for two hours, contain six to eight students per group, in space suitable for small-group activities.
- PLTL is supported by the department and the institution with funds, course status and other support.

The PLTL model is robust and has been successfully introduced in both two and four year colleges as well as research universities. Although the model is most well developed for chemistry, it has also been successfully implemented in biology, physics, mathematics, and computer science courses. As David Gosser, Project Director and PI of the PLTL project, has noted, "…the greatest strength of the PLTL model is that it presents a structure that creates a real sense of community of scholars, where students can realize the ultimate goal of taking responsibility for their own learning."

A conservative estimate of implementations indicates that over 180 faculty have adopted the PLTL model at 150 colleges and universities in chemistry, biology, physics, mathematics, psychology, nursing and computer science; affecting more than 20,000 students per year who are led by 1,600 peer leaders. The names and affiliations of faculty who have introduced PLTL in their courses can be found on the project web site (http://www.pltl.org).

The PLTL National Project owes its success to the students, peer leaders, faculty and learning specialists who have participated in the development and support of the PLTL model. David Gosser, Jack Kampmeier, Mark Cracolice, Victor Strozak, Ellen Goldstein, Michael Gaines, Joseph Griswold, Madeline Adamszeski, Dennis Bartow, Leo Gafney (Project Evaluator), AE Dreyfuss (Project Manager) and Ingrid Leal deserve special mention for their contributions to the shared vision of the PLTL model.

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