The Workshop Project Newsletter

Volume 5, Issue 4

Summer 2004

PROGRESSIONS: PEER-LED TEAM LEARNING

INSIDE THIS ISSUE:

website: www.pltl.org

TWO PLUS TWO EQUALS MORE: MODIFYING THE CHEMISTRY CURICULUM AT UTEP

How familiar is this pattern for a three credit-hour course: three lectures per week, three lectures per week, three lectures per week . . . ? As of Fall 2000, however, we have a new weekly format for general chemistry at our institution: two one-hour lectures plus one two-hour required, well-integrated Peer-Led Team Learning (PLTL) Workshop. The PLTL Workshop in General Chemistry was adopted in answer to those Big Questions: Why are three lectures a week a necessary standard? Who mandated that rule? What has been the result of the change?

El Paso, Texas, has a population of 650,000, of which 80% are Hispanic. Juarez, Mexico, 1000 feet from our campus, has a population of 1.5 million. El Paso is located within the Chihuahuan Desert and is the home of UTEP, the University of Texas at El Paso.

The student population profile at UTEP is fairly non-traditional: the average undergraduate age is 24 years; 70% of the student body is Hispanic (Mexican American), 54% is female, 82% is from El Paso County, 98% commute, 81% is employed, 54% is first generation university students, and 10% is Mexican nationals. The UTEP enrollment represents 15% of all Mexican nationals in US higher education institutions. In the fall of 2003, total enrollment at UTEP was 18,542 students, of whom 72% were Hispanic. Of the undergraduate enrollment, 2,078 were in Engineering and 1,092 were in Science, for a total of 3,170 STEM students or 17.1% of the UTEP

(Continued on page 4)

WHAT IF A CRITICAL COMPONENT IS MISSING? REVIEWING THE PLTL MODEL

Since the six critical components were developed and described to form a model through which Peer-Led Team Learning (PLTL) can be implemented, we have noted that each of these elements plays an important role leading to overall success. Conversely, when any one of the critical components is missing, the likelihood of success is greatly diminished. Site visits, WPA reports, and surveys have repeatedly illustrated how the program tends to break down when even one component is missing or not fully in place. But in analyzing the experiences of successful implementers we do find that we must reexamine and perhaps revise elements of the model in the light of practice.

<u>Integral to the Course</u> With regard to attendance, three approaches have emerged: (1) All students from a PLTL section are required to attend; (2) students make the decision at the start of the semester, and if they choose the workshops they must attend; (3) students may drop in on a week-to-week basis. The model recommends the first approach with participation by all, but in this case leaders must sometimes work hard to engage those who are less motivated. The third approach, drop-in sessions, generally fail to provide continuity and real problem-solving experiences. Many sites have selected the second approach, namely to implement PLTL with

(Continued on page 15)

PROJECT NOTES: PLTL IN CONTEXT—ACCESS AND RETENTION

A 2004 monograph from the Center for Research on Developmental Education and Urban Literacy (CRDEUL) at the University of Minnesota includes an article by David Arendale citing the contributions of PLTL. The spirit of the monograph is communicated in the foreword by Norman Stahl: "If access is granted to an institution then retention must be promoted through research-driven programs" (p. vii) Arendale's article, "Pathways of Persistence: A Review of Postsecondary Peer Cooperative Learning Programs," (pp. 27-40) focuses on postsecondary peer learning programs that, meet clearly defined characteristics of systematic procedures for implementation; have been evaluated; embed learning strategies with learning of content; include outcomes of increased content knowledge and persistence; and have been replicated at other institutions. The programs cited in the review are: Accelerated Learning Groups (ALG); Emerging Scholars Program (ESP); Peer-Led Team Learning (PLTL); Structured Learning Assistance (SLA); Supplemental Instruction (SI); and Video-Based Supplemental Instruction (VSI). Each of the programs are described in some detail and are finally analyzed according to levels of integration within the course. The Level Four programs, (ESP, PLTL, and VSI) defined as a comprehensive learning system within the course, were found to have the highest likelihood of improved student outcomes.

For those of us who have worked on PLTL, the article is of great interest because, 1) It can be shared with faculty and administrators concerned about issues surrounding access and retention; and 2) it provides a larger view with which we can see ourselves, connecting us with other programs that have similar goals and overlapping methods.

PLTL has been implemented since the early 1990's, and has gone through stages of initial development, refinement, and dissemination. I see the key challenges for continued growth and success of PLTL in the future as: 1) Maintaining the intellectual excitement and growth of PLTL by the integration of leader training and pedagogy with new curricular models, such as interdisciplinary interactions and research based learning; and 2) integrating PLTL with institutional goals and programs.

Early on in the project, Leo Gafney, the PLTL Project's evaluator, observed the implementations of what was then called "Workshop Chemistry" and formulated, with others, a set of "critical components" that he deemed necessary for success. His foresight in developing this framework has turned out to be an extremely powerful tool for authentic dissemination of PLTL. Educational initiatives and concepts can be ambiguous; without clear definitions, however, they can lead to different and even contradictory interpretations and of course, ambiguous results. The critical components provide a simple checklist by which one can measure the relative success of an implementation, and also can be used to measure the validity of a learning outcomes assessment. If one of the critical components is missing in large part, then the outcome is unlikely to be favorable. For instance, a key element is a leader who mentors a group consistently for the entire semester. According to Gafney's observations, a roving leader to a larger group is less likely to follow the thread of the smaller group's thoughts and respond effectively, and will not form the longer-term personal bond and leadership that are a key to the effectiveness of PLTL.

Finally, there is a third perspective, equally as important as the quantitative studies that indicate improved academic success for students engaging in PLTL. This very personal perspective is forthrightly presented by HyeJin Eum, a peer leader at The City College of New York, who describes a personal transformation that is in one sense unique and in another sense ubiquitous through PLTL.

David Gosser
The City College of New York
Gosser@sci.ccny.cuny.edu

Reference

Duranczyk, I.M., Higbee, J.L., Lundell, D.B. (Eds). (2004). *Best Practices for Access and Retention in Higher Education*. Minneapolis, MN: Center for Research on Developmental Education and Urban Literacy, General College, University of Minnesota.

Progressions: Peer-Led Team Learning
The Workshop Project Newsletter
Summer 2004, Volume 5, Issue 4

David Gosser, Editor, gosser@sci.ccny.cuny.edu
AE Dreyfuss, Managing Editor, aedreyfuss@aol.com
Leo Gafney, Contributing Editor, leo.gafney@sbcglobal.net

The City College of New York
Marshak Science Building J-1024
160 Convent Avenue, New York NY 10031
Phone: 212-650-5704 Fax: 212-650-8339
Email: info@pltl.org Website: www.pltl.org
Reproduction of material appearing in *Progressions* is encouraged with appropriate citation (author, date, issue volume and number). *Progressions* (ISSN 1539-1752—print; ISSN 1539-7483—online) is published four times a year by the PLTL Workshop Project.

This newsletter is supported by a grant from the National Science Foundation's Division of Undergraduate Education. The views expressed herein do not necessarily represent those of the National Science Foundation.

A Woman, A Korean, And a Workshop Leader

In 2003 I got a letter from the Peer-Led Team Learning Workshop program at The City College of New York a few days before school started. I opened it right away: The letter said that I was chosen as a candidate to be a Workshop Leader in Chemistry. Of course, my first reaction was not to apply for such a position. Because I come from another country, that's why I cannot speak English fluently. And the main reason is that I hate to show myself up in public. I had never imagined myself talking in front of students in the class.

Let's talk about my culture and character. I am a woman and from Korea. Probably people think what's wrong with me? I definitely think that my gender and ethnicity can be problems to study in American schools. For example, in my culture, students are taught to listen to lecture, sitting up straight. The professors and students do not have a lot of conversation. Professors just teach and students just listen and take notes on what professors say. For this reason, we do not often spend time having a discussion in the class. Expressing one's thoughts and opinions to a professor is usually considered being impolite toward someone who is senior, especially professors. Furthermore, not talking in public is viewed as a good quality. It is accepted that women should be women: they should be quiet and listen, instead of talking. When I took a sociology class in America, a professor asked me about some topic but all of sudden, I was nervous and I could not come up with anything to say, nor how to organize my thoughts. I was not used to expressing my opinion in public, thus I could not participate in any discussion. Similarly, it seemed an impossible role to be a Workshop Leader who needs to teach or talk to students logically. Being a leader was not easy for a Korean woman. However, all of sudden, something changed around me. Finally, I decided to go for the interview.

At the interview, six people came together: three interviewers and three candidates. We sat down around a table and one after another, each of us was given questions. I was sweating with nervousness. I guessed people must be laughing at my poor English and behavior. I was so shy and did not have any self-confidence at all. After having this interview, the most serious thing happened to me. It was that I became a Workshop Leader. I expected I would fail the interview and I would feel sympathy for myself, thinking that applying for this position was a courageous action to me.

However, I cannot help being surprised at the result but now it was important to practice. As soon as I arrived home, I practiced for my first day of workshop as though I would practice to address an inauguration. However, when I stood up in front of students in my first workshop session, I was almost frozen, almost dying. I could not say anything that I had prepared. It was much more scary than if I had tried to do Bungee Jump. For the next workshop, I managed to induce students to discuss ways for solving problems. I also practiced my English to express myself clearly.

I'd like to say how this workshop had influenced me both inwardly and outwardly but fortunately, I finished my first workshop successfully instead. Before I became a leader, I did not say anything in the other classes but listened or took notes from lecture. Can you guess how I have been changed in the other classes? I still cannot forget the day when I presented my opinion to a professor and other students and also could not forget the unbearable tension. I started to express my opinion in public as well as in the Leader Training class. I was not an outsider anymore. Professors and classmates were going to recognize me and I found it was a great experience that I expressed my thoughts and opinions in public. I realized that learning while discussing or cooperating has a higher efficiency than learning alone. When I was in Korea, without instruction or hint from the professor, I could not solve the problems. After practicing through workshop, I did not just follow instruction passively but I started solving the problems, cooperating with other people or alone.

In addition, the role of Workshop Leader could encourage my sociability while I discussed with students how to solve the problems. Owing to my culture, I listened patiently to what students thought. These activities improved my sociability and good listening could help me make many friends. All of a sudden, my school life has been totally changed. I have become an active and sociable student. I believe that the workshop experience can affect not only my school life but also my whole life.

I think my change has started from a small opportunity. If I had not gone to the interview or if I had not accepted the workshop position, I would still see myself as a Korean woman who cannot express my opinion in public and cannot cooperate with other people because of a perceived shy and timid personality as an outsider in this society. Reflected from my experience, I suggest that when you even have a small chance, not to hesitate but to take it, and then make the most of it for yourself. Even small chances can have a strong effect on yourself. If you get a letter from the Peer-Led Team Learning Workshop program at The City College of New York, open the door right now.

HyeJin Eum
The City College of New York
pearleum@yahoo.com

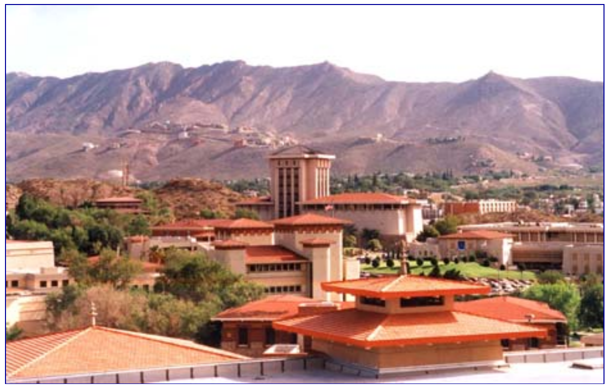
Two Plus Two Equals More

(Continued from page 1)

undergrad enrollment.

<u>Numerology: First Year Chemistry Courses at UTEP</u>

About 650 students per year attempt CHEM 1305, first semester general chemistry (required of every Science, Technology, Engineering and Mathematics (STEM) major). Historically the course had three clock hours of lecture for three semester hours of credit and had an historical passing rate of 55%. CHEM 1105 was the accompanying three clock-hour, one credit-hour laboratory course and CHEM 1306/1106 was the second semester Lecture/Lab combination. The low success rate in the first semester course meant that about 160 students each year were blocked in their progress on to a STEM major. Three failed attempts at passing this course prevent a STEM future for any student.



Non-STEM majors needing a course in chemistry take CHEM 1407, first semester Introductory Chemistry, which is primarily for nursing students; this course also has three clock hours lecture and three clock hours lab per week, followed by CHEM 1408, second semester Introductory Chemistry.

<u>UTEP Context: Mathematics Preparedness of Entering Freshmen</u>

The only course prerequisite for CHEM 1305 is concurrent enrollment in Pre-calculus. However, this also presents a problem for a "traditional" four-year course of study for STEM majors on our campus. Here are the facts for math placement for entering freshmen for Fall 2003; placement into:

Pre-Calculus:	27%
Calculus I or II:	4%
Math for Social Scientists:	6%
Remedial Math I or II:	63% (Basic Algebra, Intermediate Algebra, no university credit)

Conclusion: Only about 30% of each entering class is math ready and meets the requirement to enroll in general chemistry their first semester on campus.

<u>Why is a "Required" Workshop Component Important? Teaching Me a Lesson</u>

In the early 1990's, over the strong but unsuccessful objections of the Chemistry Department, several Engineering disciplines made the parallel first semester chemistry laboratory course (CHEM 1105) optional for their majors. Immediately, 95% of those students no longer enrolled in CHEM 1105.

I concluded that, 1) with an optional, albeit valuable, course or learning opportunity, students would not voluntarily enroll; and 2) for many engineering students (35% of the total 1305 enrollment), no hands-on activities would be a part of their "chemistry" experience.

<u>Nitty-Gritty: Time on Task</u>

It was time to make some kind of revision in the general chemistry curriculum to improve the success rate. One option (everybody's first choice) was to add more lectures per week, say four (or five or . . . how many hours per week?). But would that significantly lead to better student mastery, i.e., understanding, and long-term retention of concepts? My supposition was, probably not. What I think we all know: The key to student mastery of this material is personal, active study: quality time by each student in frequent, short periods struggling with the application and integration of the concepts. This became the argument of including Workshop to improve the historical 55% passing rate in CHEM 1305: more PLTL active help in learning how to study and less time lecturing at the students (passive).

In the Summer of 2000, the Director of UTEP's Model Institutions of Excellence (MIE) grant from the National Science Foundation (NSF) approached me to request a proposal to fund incorporating peer-led, team-based learning into the 1305 curriculum. I was not that familiar with PLTL and my initial response was, "OK, let's add one hour of PLTL activities per week as a required component."

The Administration reaction was "No Way!!" A required added hour of course activity per week would necessitate a change to a four credit hour course; this would precipitate negotiating through the regular University approval process and all the other departments affected by the additional credit hour, etc. To meet the University hurdles head-on (remember: Change is GOOD!), I then made the proposal to keep the course at three credit hours, but add a completely new dimension: PLTL Workshop. To "make room" something had to go! I took a big gulp and the proposal was to delete one lecture per week. Some of my colleagues were very skeptical that this would achieve the desired results.

Changing the format of CHEM 1305

Previously, as mentioned, the course consisted of three lectures per week in large sections (100+ students). Beginning in the Fall 2000, a new format was adopted: two one-hour lectures (large section) per week plus one two-hour Peer-Led Workshop (small section) per week. Student Peer Leaders (undergraduate STEM majors) were hired to lead the two-hour Workshops.

To accommodate the student enrollment in fall and spring semesters, the small section format requires that there be about twenty-four sections of Workshop. These are scheduled throughout the week with two workshop groups meeting in different rooms, but simultaneously per two-hour time period (this allows for "Peer Leader substitution" in an emergency). Each Workshop section has about 12 students commingled from the lecture sections; each Workshop is taught by a paid Peer Leader.

Registration: How it looks in the "Schedule of Classes"

- Physical Science Room 200: for collaborative, team-based learning
- Physical Science Room 310 for "wet chemistry": a central island table with lab benches along outside walls.

Note: Students enrolling in Chem 1305 must enroll in ONE lecture Section plus ONE Workshop Section below

CHEM	**1305**	**General**	**Chemistry**		
25933	LECTURE	MW	1030-1120 am	UGLC 116	Gardner
26145	LECTURE	TR	0800-0850 am	PSCI 208	Noveron
CHEM	**1305**	**General**	**Chemistry**		
27037	WORKSHP	M	1130-0120 pm	PSCI 310	Noveron
27044	WORKSHP	M	1130-0120 pm	CRBL 203	Gardner
27045	WORKSHP	T	1200-0150 pm	PSCI 310	Gardner
27050	WORKSHP	T	1200-0150 pm	PSCI 200	Noveron
-	WORKSHP	W	-	-	-
-	WORKSHP	W	-	-	-
-	-	R	-	-	-
-	-		-	-	-

Explorations: What are they?

Chemistry is an experimental science where process and concept mastery are paramount! The 1305 Workshop includes Guided Inquiry "laboratory" exercises called *Explorations*. Laboratory is usually an integral part of the chemistry curriculum. *Explorations* are simple, somewhat descriptive, and much more qualitative in nature than the usual laboratory exercises. They are geared to relating observation to chemical processes and provide real-world examples of chemistry in action. Problem-solving strategies depend on conceptual understanding; hands-on observation of simple reactions builds an understanding of chemical processes and concepts. *Explorations* are not a substitute for laboratory; they complement rather than "compete" or duplicate the regular 1105 laboratory exercises accompanying the 1305 lecture.

Explorations: Why?

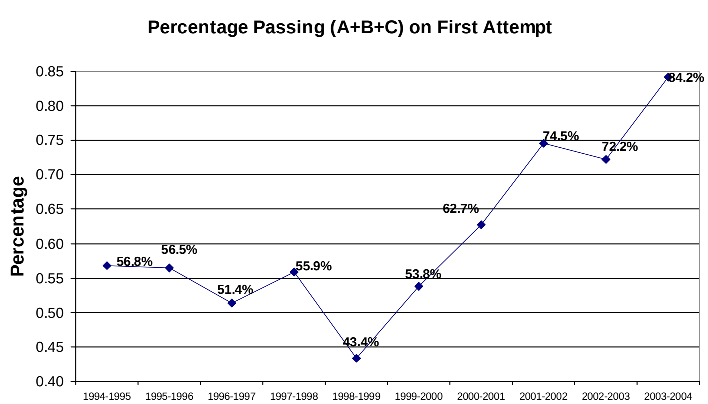
Some disciplines no longer require CHEM 1105, the laboratory parallel to CHEM 1305. Without the opportunity provided by Workshop, about one-third of the students enrolled in 1305 would not have any hands-on experience in chemistry; they would never see, feel, hear, and smell actual chemical reactions that they have initiated, that they can tweak to influence what happens, and that they can repeat to ascertain that what happened didn't just happen by chance. They would not otherwise have the chance to apply chemical concepts to "real-life" experiences.

Examples of *Explorations*

1. Growing Silver Crystals as an example of a chemical reaction.
2. The Sahara Desert and the concept of the Mole.
3. Slinkies and Standing Waves.
4. Spectroscopes: Explore the particle/wave duality of light.
5. Acid/Base reactions using purple cabbage extract and "bad breath" indicator.
6. Simple Titrations: ammonia soap and vinegar.
7. Peladow and Hammer: A four-act ChemPlay starring calcium chloride and baking soda.
8. Gas Law Explorations: Crushing Soda Cans.
9. Dry Ice/Floating Bubbles: Use soap bubbles to demonstrate the difference in densities of carbon dioxide and air.
10. Ironic Chemistry: Prepare Iron (II) and Iron (III) from reaction of steel wool with nitric acid; then explore redox chemistry, acid/base chemistry, and solubilities.

Outcomes

§ Marked improvement in Student Success (Percent [A + B + C] Grade) in course.



(Continued on page 6)

- Increased number of STEM majors progressing through this pathway course to enter their degree programs.
- Exposure of **all** General Chemistry students to actual chemical events.
- Better conceptual understanding of the process of chemistry for improved problem-solving abilities.
- Definite strengthening of Peer Leader understanding of chemical principles.
- Exposure of Peer Leaders to the practice of teaching, and:
- Unexpected Outcome: Many Peer Leaders consider teaching at the secondary level as a career.

Peer leaders guide student teams through problem-solving and concept-building exercises

Institutionalization: Challenges and Opportunities

In the Spring of 2003, the State of Texas substantially reduced the UTEP biennium budget for the 2004-06 period. In the Fall of 2003, to cover the impending deficit, UTEP proposed a tuition increase for Spring 2004 and further increases for Fall 2004 and Spring 2005. The UT System responded by requiring 25% of any tuition increase to be coupled with new opportunities for Student Financial Aid. In the Spring of 2004, I proposed to the UTEP Committee for Institutional Funding for CHEM 1305 PLTL Workshop for the 2004-2005 year and (amazement!) the proposal was successful(!): $27,420 was awarded (for this one year).

Show me the money!

Three hundred students in the course per long semester requires about 24 sections; 24 sections mean 12 Peer Leaders. Twelve peer leaders, for 15 weeks, each working eight hours per week, at $7.50 per hour, is an annual (Fall, Spring, Summer) cost of under $30,000.00

Cost Analysis

However, a 25% increase in student success (55% to 80%) in CHEM 1305 translates into about 160 more students at UTEP successfully progressing through this Gateway course into STEM majors each year. The annual loss in tuition for just **12** full-time students, or less than 10% of those 160 who previously failed 1305 and may have quit school (very conservative estimate), represents about $36,000 annually lost to UTEP. So the Cost Benefit Analysis is about $27,000 versus $36,000: a very worthwhile comparison.

James E. Becvar
Chemistry Department
University of Texas at El Paso
jbecvar@utep.edu

Originally presented at the 18th Biennial Conference on Chemical Education, University of Iowa, Ames, IA, July 2004.

Acknowledgments

Thanks to all those excellent Peer Leaders! And thanks to Ben Flores, Director, Model Institutions of Excellence (MIE) Program and Grant to UTEP from the National Science Foundation. Thanks also to Ann Darnall, MIE Statistician. The MIE Grant funded the development of CHEM 1305 Workshop and its Peer Leaders from Fall 2000 to Spring 2004. Since Fall of 2004, support for Peer Leaders has come from UTEP Institutional Funding.

Good Source of Peer Leaders: ACS Affiliates
About 50% of the Peer Leaders since 2000 have been ACS Affiliates. Many of the 1305 *Explorations* have come from vignettes developed for the UTEP Chemistry Circus (an outreach activity put on by Affiliates for students of all ages in the El Paso community).

Selected Resources on POGIL & PLTL (See pg. 9)

Spencer, J. N. (1999). New Directions in Teaching Chemistry: A Philosophical and Pedagogical Basis. *Journal of Chemical Education.* 76, 566-569.

Farrell, J. J., Moog, R. S., Spencer, J. N. (1999). A Guided Inquiry General Chemistry Course. *Journal of Chemical Education.* 76, 570-574.

The POGIL Project Website: www.pogil.org

Berke, T. (2003). Good Students Become Great Leaders. Benjamin Cummings' *Strategies for Success*, Spring 2003 (39). [Lead article at http://www.aw-bc.com/events/strategies/newsletters/index.html; select issue # 39.]

Berke, T. (2003). Teamwork Works. *NEA Higher Education Advocate*, October 2003. [Lead article at http://www.nea.org/he/advo-new/front.html; October 2003 issue.]

Piloting PLTL in General Chemistry at Monroe Community College

Since 2000, Peer-Led Team Learning has been a part of the Organic Chemistry course sequence at Monroe Community College (MCC), located in Rochester, New York. Since the implementation of PLTL in the organic courses, student performance has improved as measured by the standardized ACS exam administered at the end of the second semester organic course.

With the support of the chair, the department, and a WPA grant, PLTL was pilot-tested in the first-semester general chemistry course in the Spring 2003 semester. Approximately 340 students enroll in Chemistry 151 (CHE 151 General College Chemistry I). Many of the students taking the general chemistry courses are enrolled in either the liberal arts and science or engineering science tracks for A.S. or A.A. degrees and/or are planning to transfer to four-year institutions and/or are fulfilling prerequisites for graduate programs. Historically, the success rate (students earning a grade of C or better) in CHE 151 is 49% (from the Fall 1999 term through the Fall 2002 term). PLTL has been demonstrated to improve student success and retention in different science courses across a range of institutions. Therefore, one hope in implementing PLTL in CHE 151 was to improve the success rates.

In the Spring 2003 semester, Peer-Led Team Learning was implemented in one CHE 151 section enrolled with 26 students. The CHE 151 course meets for three lecture hours and three laboratory hours. Since PLTL was being introduced into an evening class, the three-hour lecture format was changed so that the first two hours were an overview and exploration of key concepts, and the third hour was devoted to the PLTL workshop. Each PLTL section (8-9 students) met separately with its individual leader. The PLTL materials designed by the course instructor explored concepts covered in the previous two hours and provided opportunities for students to discuss ideas and apply mathematical relationships.

The peer leaders were trained through a pre-semester Orientation, including participation in a mock Workshop and discussions of "What makes learning chemistry hard?" and other classroom knowledge issues (e.g., group dynamics and learning styles). In addition, the instructor met weekly with the leaders to debrief current issues and provide them with pedagogical content knowledge, that is, they reviewed "take home points" on the upcoming Workshop, and discussed how to teach subject matter effectively (e.g., issues in problem-solving, alternative conceptions, etc.)

How did PLTL impact the student experience in CHE 151? With respect to student performance, we compared the success rate and withdrawal rate for the PLTL students in the Spring 2003 term with historical data from Fall 1999-Fall 2002. The success rates were similar, that is, 61.5% of the PLTL group earned grades of C or higher compared to 59.0% of students enrolled in the evening sections of CHE 151. (Note: the success rate reported above of 49% includes all students enrolled in the day and evening sections in that time period.) While the pilot implementation of PLTL did not have a measurable impact on student success, there appears to be an influence on the withdrawal rate. Historically, 26.2% of the students had withdrawn; however, in the Spring 2003 term, this was reduced to 15.4% with PLTL. Because of the small sample size, this difference is not statistically different.

Table 1. PLTL vs. Historical Success Rates—CHE 151

	PLTL (n=26)	Historical F '99-F '02 (n=183)
Success rate	61.5%	59.0%
Withdrawal rate	15.4%	26.2%

At the end of the semester, students were asked to complete a survey adapted from the Student Assessment of Learning Gains (SALG) to provide insight into their perceptions of their learning experience. Students were asked the following question, "How much did each of the following HELP YOUR LEARNING?" and asked to rate the effect of various items on a 5-point Likert scale. Twenty-one students completed the survey and the results are reported in Table 2. Clearly, the students did not value the PLTL experience in their overall learning experience. As a compari-

Table 2. Student Attitudes—Spring 2003 vs. Spring 2004

	Sp '03	Sp '04
1. Interaction with instructor	4.40	4.54
2. Lecture	4.38	4.11
3. Lab	4.17	4.15
4. Working with classmates	3.64	4.11
5. Textbook problems	3.31	3.17
6. Text reading	3.26	3.17
7/8. Workshop problems	3.00	N/A
7/8. Interaction with PLTL leader	3.00	N/A

(Continued on page 8)

son, Table 2 also includes responses from twenty students enrolled in the evening section of CHE 151 in the Spring 2004 semester (both courses taught by the same instructor). PLTL was not implemented in the Spring 2004 course. With an average of 4 or higher, the students in both the Spring 2003 and Spring 2004 CHE 151 courses valued the interactions with their instructor, lecture, and lab as the most valuable aids to learning general chemistry. The Spring 2004 students also valued the collaboration with their classmates.

...many of the students wanted to be given the answers and did not value the collaborative process of teamwork and problem-solving.

The question arises as to why the students did not value the PLTL experience as the two PLTL-related items were rated the lowest by the Spring 2003 students. There were several challenges. First, many of the students wanted to be given the answers and did not value the collaborative process of teamwork and problem-solving. Second, students valued the interactions with the lecturer and preferred interaction with the professor over the peer leader; this may be due to a combination of the instructor's student-centered style and students' perceived confidence in the instructor's knowledge base over the peer leaders'. The small class size of 26 students provided multiple opportunities for student-instructor interaction, both in the lecture and the laboratory. Finally, the scheduling of the PLTL Workshop in the third hour of a three-hour block did not allow time for students to reflect and think about concepts prior to working on the Workshop problems. Consequently, the pilot implementation had low buy-in by students despite the correlation between PLTL problems and exam problems.

Fall 2003: The second iteration

PLTL was implemented in the Fall 2003 semester by a second instructor. The instructor was teaching three separate lecture sections during the day; one section was designated the PLTL section and the remaining two sections were assigned as Control. Each section met three times a week for a 50-minute lecture and for one three-hour laboratory session. In the PLTL section, the lectures were divided into two traditional lectures and the third session was run as a PLTL workshop (n=48), while the two Control sections (n=100) had three traditional lectures a week. In addition to the same instructor teaching all of the sections, other factors, including the textbook, laboratory, and exams, were held constant.

Originally, the PLTL lecture section was a single section of 26 students; however, because of high enrollments in the CHE 151 course, a second section was opened not long before the start of the semester, thus creating a double section with an enrollment of 48. Three peer leaders had been hired with the intent of forming three PLTL sections of 8-9 students per workshop. None of the leaders had previous experience with PLTL as a student or as a leader. Because of the last minute nature of adding a second section, there was not time to hire additional leaders. Thus, the three leaders were also joined by the course instructor. The PLTL class was divided into eight workshop groups with 6-7 students per group, and the four leaders rotated throughout the large lecture hall.

At the end of the semester, students were asked to complete the PLTL student survey to provide insight into their perceptions of their learning experience. Table 3 compares the student responses, PLTL vs. Control, to the question "How much did each of the following HELP YOUR LEARNING?"; the items are listed in order of the top five items as ranked by the PLTL students. It appears that the Control students rated "Discussion in class" higher than the PLTL students; however, there were no statistically significant differences between the groups on any item. Compared to the Spring 2003 student response, the PLTL students in the Fall 2003 course ranked one PLTL-related item, "Peer leaders as a resource", strongly with an average rating of 4.00 (out of 5).

Table 3. Fall 2003, PLTL vs. Control. How much did each of the following HELP YOUR LEARNING?

	PLTL (n=29)	Control (n=41)
1. Relationship of classwork, lab, readings, and activities	4.41	3.80
2. Teamwork in labs	4.24	3.88
3. Peer leaders as a resource	4.00	N/A
4. Quality of contact with instructor	4.00	3.93
5. Discussion in class	3.86	4.12
6. Lecture	3.59	3.63
7. Text	3.00	3.34

Students were also asked "How much of each of the following do you think you will remember and carry with you?" Table 4 shows that the PLTL students rated each aspect higher than the Control students. The p-values

Table 4. Fall 2003, PLTL vs. Control. How much of each of the following do you think you will remember and carry with you?

	PLTL (n=29)	Control (n=41)	P-value
1. Understanding the main concepts	3.72	3.49	0.34
2. Feeling comfortable with complex ideas	3.59	3.17	0.08*
3. Solving problems	3.90	3.46	0.06*
4. Ability to think through a problem	3.90	3.46	0.07*

(Continued on page 9)

for the two-tailed t-tests indicate no statistically significant differences at the 0.05 level, but it appears that the PLTL experience may have had an influence as there were differences with respect to how the students rated "understanding the main concepts," "feeling comfortable with complex ideas," and "solving problems" (at the 0.10 level). The response to a follow-up question (shown in Table 5) also demonstrates that students felt that the PLTL Workshop impacted their learning.

Since the PLTL students believed the PLTL Workshop was a positive experience, the question remains whether or not this affected student outcomes such as success rate, withdrawal rate, and performance on course exams. Table 6 shows no differences in success rates, PLTL as compared to the Control or historical data. The PLTL students were less likely to withdraw from the course, but a chi square analysis shows the difference is not statistically significant.

Table 5. Fall 2003, PLTL. How much has the Workshop helped you makes gains in…

	A great deal/fair amount	Some/ little/ none
1….understanding the relationship between chemistry concepts?	79%	21%
2. ...your ability to solve problems?	67%	33%
3. ...feeling comfortable with complex ideas?	66%	34%
4. ...your ability to think through a problem?	63%	37%

An analysis of student performance on the final cumulative exam does show a significant difference. The Control students scored higher than the PLTL students ($p=0.03$, two-tailed t-test). The question, then, is what factors could account for the difference in exam performance. If the PLTL students had outperformed the Control students, then a contributing factor could be the PLTL Workshop experience. Conversely, does the observed result indicate that the Control experience is a better learning experience for students? We do not believe that PLTL is detrimental to the students. We hypothesize that the difference may be due to the differences in students enrolled in the PLTL vs. Control sections. If the PLTL students were weaker to begin with, then the pre-existing differences could account for the difference in exam performance. While we do not have any pre-course measures to demonstrate differences in academic preparation, historical data show that the time of the PLTL lecture section (offered at 3PM) may be an important factor with respect to the students who enroll; that is, the 3 PM lecture tends to have a success rate that is 10% lower than the lecture sections offered earlier in the day (10AM and 1 PM). Also, a comparison of those students who completed the final exam show that there were twice as many Control students with grades of A or B ($p<0.05$). It is possible that the Control sections started with a student population that was academically better prepared. Finally, looking at the student performance on the four in-class exams shows that the PLTL students score below their Control counterparts on each of the four exams.

Table 6. Fall 2003, PLTL vs. Control. Student outcomes

	PLTL (n=48)	Control (n=100)	Historical F '99-S '03 (n=1169)
Success rate	46%	42%	49%
Withdrawal rate	17%	35%	22%

Further, organizational arrangements were not conducive to helping the groups form: the leaders rotated among groups; all groups met in the same space; and the space was not conducive to group work (individual desks in a large lecture hall).

While there was no statistically significant difference on any of the individual exams, there is a difference when comparing the sum total of the performance on the four in-class exams. Perhaps, then, it is not surprising to see this outcome mirrored in the cumulative final exam performance.

Table 7. Fall 2003, PLTL vs. Control.

	PLTL avg (SD) (n=35)	Control avg (SD) (n=60)	P-value
Final exam (out of 100)	62.99 (13.50)	70.27 (16.76)	0.03[a]

[a] t-test (2-tailed); [b] Chi square; [c] Fisher exact (2-tailed)

In addition to the possibility of pre-existing differences in the PLTL and Control populations, there were several challenges in the implementation of PLTL that should also be considered. As an instructor new to the PLTL approach, there was a steep learning curve in developing materials, and he felt that more time was needed to generate better activities that optimized the interactions and discussions that ensued in the PLTL Workshop. Further, organizational arrangements were not conducive to helping the groups form: the leaders rotated among groups; all groups met in the same space; and the space was not conducive to group work (individual desks in a large lecture hall).

Despite the various drawbacks, the peer leaders found the experience positive overall. They felt the experience strengthened their communication and leadership skills, developed teaching skills, and deepened their understanding of chemistry concepts. As one leader wrote: "I have learned that I truly enjoy teaching and helping other students improve and that whatever career I choose should

(Continued on page 14)

PLTL Meets POGIL At MADCP

As every scientist knows, the most important thing you learn in an investigation often isn't at all what you thought you were going to learn: it is something totally unexpected. Such was the case for us at the June 2004 meeting of the Middle Atlantic Discovery Chemistry Project (MADCP).

The trail begins at the 2003 PLTL National Leadership Conference, held at the City College of New York on October 9-12. This conference included a well-received workshop by Jim Spencer of Franklin and Marshall College entitled "POGIL Meets PLTL: The Use of Process-Oriented Guided Inquiry Learning in Workshops." Jim is one of the creators of POGIL, and that he would be invited to speak makes perfect sense because POGIL and PLTL share many of the same goals and some of the same approaches. Jim took the opportunity to present the participants with an overview of the POGIL methodology, which follows a learning cycle paradigm, to conduct a POGIL workshop, and to discuss the possibility of using or adapting the POGIL materials and the POGIL approach to a PLTL workshop setting.

In November 2003 Rick Moog, another of the architects of the POGIL approach, sent a message to recent MADCP participants, asking if we were willing to make a presentation or to run a workshop at the 2004 MADCP meeting. For the authors of this article, the decision was a no-brainer: we each wanted to present something on PLTL. One of us suggested a mirror image of Jim's workshop: "PLTL Meets POGIL." It seemed clear that the MADCP conferees, largely adherents of POGIL, would be interested in learning more about PLTL for exactly the same reasons as users of PLTL were interested in learning more about POGIL. When Rick began putting the MADCP program together in March 2004 he noted that since we had similar presentation interests, perhaps we would be able to work together to whip up a pair of three-hour sessions on PLTL. Both of us were open to this suggestion, and we looked forward to the collaboration. But how would we fill three hours?

Tom E., who had recent experience in presenting Multi-Initiative Dissemination (MID) Project workshops for PLTL thought, "The first two hours will be easy…we'll just do what we'd do at a MID workshop." Tom B., who has a keen interest in demonstrating the applicability of PLTL in as many disciplines as possible, suggested that to fill the remaining time we could also create and run a PLTL-style Workshop of our own. We would choose a topic of mutual interest, but also one having nothing to do with chemistry, so that we could truly demonstrate for the participants just how broadly applicable the PLTL methodology is.

We batted around a number of topics. Music theory? (Tom B. plays the flute and Tom E. the bass guitar.) A PLTL Workshop on PLTL itself? (Obviously we both have an interest in that.) We settled on "Options Trading" – as in stock options – since we both have had a little experience in this area and we were fairly certain that only a small fraction of the participants would know anything about this. If our hypothesis were true, people who knew essentially nothing about options trading would come in the front end of the workshop and, through the magic of PLTL – voila! – newly indoctrinated options traders would emerge from the other end.

Tom B. produced a draft shortly after the end of the spring semester, and we spent considerable time over the next month refining the "Options" Workshop. The questions were set up to build on the attendees' knowledge of the finances involved in the sale of a house purchased as an investment. We felt everyone would be able to identify with this analogy to stock options trading, even if they knew nothing about the stock market. A brief description of the background was given, followed by specific suggestions for the process to be followed ("think-pair-share" in some cases, "group round robin" in others) in negotiating a mutual understanding of the meaning of their answers to the subsequent questions. We worked hard to fine-tune the problem set, producing what we thought was a clear, coherent, and compelling series of questions that would guide the participants to an understanding of something about which they had previously had little or no knowledge. The final version of the Workshop covered topics of investment property, "call" options in stocks, "put" options, and finally, short sales. We were sure we were ready to go.

On the morning of June 6, 2004 we emerged from our dorm rooms at the Mt. Vernon campus of George Washington University (Washington, DC), arms filled with handouts and published materials from Prentice Hall to share with the workshop participants. Although we knew they had come to the conference mostly to hear about guided inquiry (GI) methods, we were confident that they would enjoy finding out more about another collaborative learning technique with proven benefits.

We began the session with a two-question "cryptic survey," asking – without explaining our intentions – how much they felt they knew, on a scale of 0 to 10, about (1) the stock market, and (2) options trading. The purpose of this paper-and-pencil survey was to determine who might best function as "Leader for a Day" when it came time to run our “homemade” Workshop. We wanted to give at least a few people the experience of being a peer leader (to the extent that this was possible under the circumstances), and we thought that the people who ranked themselves most highly on this survey would make ideal leaders. Simultaneously, we didn’t want these “ringers,” if there were any, giving away all the answers to the members of their group.

After completing the survey, the participants broke into pairs for an icebreaker. We asked them to interview each other, finding out their partner’s name and area of specialization, how long they had been teaching, why they came to the MADCP conference, and what they hoped to get out of the PLTL session. Each person then introduced his or her interviewee. The participants came from all chemistry sub-disciplines: physical chemistry, biochemistry, organic, analytical, environmental, materials science, chemical education, and high school chemistry. There were graduate students, and there were folks with forty years’ teaching experience (the average was 14 years). People had come to the conference to learn how others were using GI methods in their classes, to learn new approaches for active learning, to meet new people, to get ideas for upper division courses, to find ways to motivate non-science majors, and because they were dissatisfied with the traditional lecture format for teaching. They came to our session because they knew a little about PLTL and were curious to learn more, or they wanted to know if PLTL was right for them, or because they wanted to contrast POGIL with PLTL, or because they were ready to adopt PLTL and just needed additional information. We listed their interests and concerns on the board in front of the room, and left the information there so we all could refer back to it: for us to shape our comments to fit the participants’ stated interests, and for them to decide as we went along if the session was filling their needs. We also listed some of the important similarities and differences between the PLTL and POGIL approaches.

We wanted to get the participants involved in *doing* workshop chemistry as early as possible in the session, so we gave only a very brief overview of the essential features characterizing PLTL. Participants were given a handout with all the slides we would show that day, so they would not have to waste time scribbling down everything that appeared on the screen. But before beginning our first workshop, we gave one more handout – a series of questions for them to answer as the session went along, to try to get them thinking about some of the key elements of the PLTL process:

- What is the model peer leader doing during the workshop?
- What do the students have to do to make a PLTL session work?
- In preparing materials for a PLTL Workshop, what would a faculty member have to do to ensure a successful experience?
- Are PLTL Workshops appropriate for qualitative questions, quantitative, or both?
- Do you think that PLTL will enhance student understanding?
- What skills are learned in a PLTL environment?
- What are the advantages (if any) of straight lecturing over PLTL?

Over the next 45 minutes, we served as the “peer leaders” while the participants – now divided into groups of three or four – went through an abbreviated version of the “Chemical Kinetics” Workshop (Gosser, et al., 2001). This exercise has been used with great success in MID Project workshops, and in other “Introduction to PLTL” settings. The Workshop deals with first-order kinetics for both irreversible and for equilibrium reactions. The kinesthetic aspect of this Workshop – the physical process of actually moving the pennies – makes it particularly appealing, and particularly effective at driving home what might otherwise be abstract concepts. [Note: A version of this workshop appears in *Progressions,* 1999, 1(1), 8-9, and is available under *Dissemination Materials* at www.pltl.org.]

Now suitably familiarized with the format of a typical PLTL Workshop, the MADCP participants were given a more detailed description of PLTL. We wanted them to have enough background to get started if they had been sufficiently tantalized. Helpful information was provided about the PLTL website; how to get administrators and staff involved and interested; physical space needs for running workshops; and various models for leader selection and (especially) leader training. Copies of the Prentice Hall PLTL series were distributed to each participant, and then we took a ten-minute break.

During the break some participants jotted down answers to the questions we had posed earlier. We pulled aside the two people who had ranked themselves most knowledgeable in terms of the stock market and options trading, and gave them very brief instructions as to what it means to be a peer leader: don’t give answers to questions; answer questions by asking questions; guide your students’ thinking by reminding them of what they already know; and so forth. We quickly reviewed the basic ideas incorporated in the “Options” Workshop, and gave these “Leaders for a Day” a few minutes to review the Workshop itself. Then we reconvened the groups.

After a few minutes of further discussion on the basics of PLTL – the benefits of active learning, the theoretical basis for why PLTL works (Vygotsky and the “zone of proximal development”), and an expanded version of the six critical components of a successful PLTL program – we were ready to start. We reminded participants that this was a work in progress. We cautioned them that they should not feel "dumb" if they didn't understand all the terminology in the Options Workshop. We let them know that they should expect to be a little confused and frustrated, at least at the outset. And then we let them get down to business.

We thought we had worked sufficiently hard to produce a series of problems that, while not exactly child's play, would still be doable by the vast majority of the participants, especially with the aid of their group members, and with facilitation provided both by us and by the "Leaders for a Day." But the participants' overall reaction was decidedly different from their earlier, favorable response to the Kinetics Workshop.

Of course, no one but a sadist wants to know he is responsible for the suffering of others. As the Options Workshop wore on, people were clearly suffering, and frustration showed on many faces. We felt bad; we wanted them to learn, but it didn't seem to be working. To be fair, some of the participants made progress, but others didn't, and the ones who didn't were not happy about being put in that position.

In retrospect, this shouldn't have surprised us too much, because it's not very different from the reaction we get to PLTL workshops when we first introduce them each semester in our classes. Students realize that they are responsible not only for doing all the work to solve workshop problems, but also that they are not going to be given very much help, or the answers, or even told whether or not they have solved the problem. Our students are not happy about this at first, but it helps when they hear that people who have been through PLTL workshops do much better in the course than those who haven't. This holds them until they see proof of it by performing much better than they expected on their first exam.

Many of our MADCP participants were not so easily assuaged. Finally, near the end of the time we had allotted for this portion of the session, one of the participants asked, somewhat peevishly, "What is the *point* of this exercise?"

We wish we could have come up with some more compelling or erudite answer, but all we had was the simple truth: "We wanted to demonstrate that PLTL could be used for teaching in *any* discipline, not just science." But instead, perhaps, all we did was to demonstrate just how frustrating it can be for our students to find themselves in a situation where they don't understand anything, don't feel like they've been given the necessary background to understand it, and don't feel like they possibly could understand it. We were left wondering if perhaps we should have picked "music" as our non-chemistry topic.

Fortunately, another of the participants pointed out the true benefit of their experience with this Workshop more explicitly: "We are getting a chance to feel what our chemistry students must feel like when first attempting PLTL Workshops." We realized that *this* lesson – the frustration of beginning students, a frustration that we don't always recognize – was the important lesson of the session, much more so than anything the participants might have learned about options trading, or even about the extensibility of PLTL to other disciplines. And the fact that one of the *participants* had said it allowed the group to finish their work on the Options Workshop with at least a modicum of good feeling.

Slightly disappointed, but certainly not defeated, we wrapped up the session with data, both our own and others', demonstrating the effectiveness of PLTL in terms of improving grades and, importantly, in terms of increased persistence through difficult courses. We showed graphs illustrating the PLTL implementation explosion that has occurred over the past five years, with respect to exponentially increasing numbers of students, instructors, institutions, learning specialists, and disciplines using PLTL. We discussed the long-term benefits of PLTL to the students and to peer leaders. To help people get started with a program of their own, we passed out documentation on PLTL from the MID Project, including an overview, a summary of web-based information, additional statistics attesting to the effectiveness of the method, and a list of published materials from Prentice-Hall. Samples of the Guidebook and the published workbooks were available for each participant who wanted one. Participants expressed gratitude over the availability of these materials, and we are indebted to Prentice-Hall for making them available to us free of charge.

We felt a little better when, after the session had ended, one of the participants approached us saying, "Don't worry. You guys didn't do anything wrong by trying this. It helped quite a bit." For the second session, (June 8th) we were much more circumspect about warning the participants of the potential for frustration, and things went more smoothly.

Tom Berke
Brookdale Community College
TBerke@Brokdale.cc.nj.us

Tom Eberlein
Penn State Schuylkill
the1@psu.edu

References

Gosser, D., Strozak, V.S., Cracolice, M. (2001). Peer-Led Team Learning: General Chemistry, 1/e. Upper Saddle River, NJ: Prentice-Hall, 158-161.

Roth, V., Goldstein, E., Marcus, G. (2001). Peer-Led Team Learning: A Handbook for Team Leaders. Upper Saddle River, NJ: Prentice-Hall.

Note: See further references on page 6.

A Comparison of the Use of In-Class Peer Leaders in Organic Chemistry

Can in-class peers perform group leadership as effectively as standard peer leaders leading a workshop at a separate time? Trying to solve implementation barriers, a group of chemistry faculty in two and four-year colleges in Pennsylvania were interested in this adaptation, using students in the class as peer leaders, for two reasons: cost reduction and increasing the availability of peer leaders. For cost reduction, we reasoned that since In-class Peer Leaders had to go to workshop anyway we would pay them half the amount of the Standard Peer Leaders, so going entirely to this system would cut costs in half. Increasing peer leader availability was important in both the four-year environment at Lehigh University and the two-year environment at Northampton Community College and Penn State, Lehigh Valley. Historically there are few peer tutors at Lehigh and implementing Peer-led Team Learning in the whole class would require about 20 leaders which I didn't think I could achieve. At Northampton Community College and the Penn State branch campus, students leave after taking Organic Chemistry, effectively preventing the program from existing. Thus In-class Peer Leaders would make PLTL possible at the two-year college level.

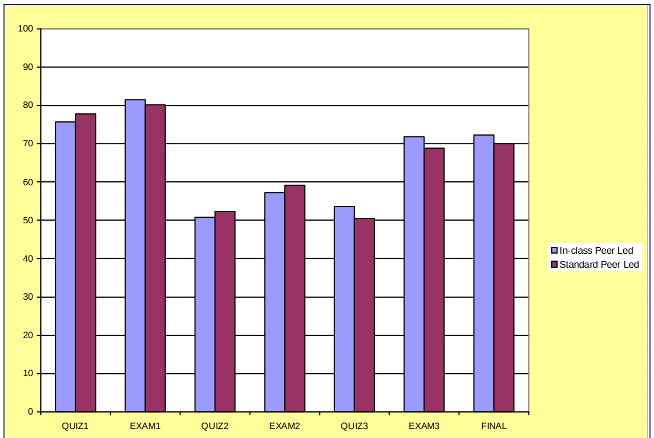


Figure 1. Quiz, Exam, and Final Mean Scores for In-Class Peer Led Students Versus Standard Peer Led Students - Fall 2003

<u>Our local environments</u>

At Lehigh, 100-140 students take Organic Chemistry each semester. Engineers comprise 28% of the class, Biologists are the majority with 50%, while Chemistry/Biochemistry majors are in the minority, with 12%, and there are about 10% of other majors. The classes are 45% sophomores, 45% juniors. At Northampton Community College, there are 25-35 students, who attend day or evening classes, while at Penn State, Lehigh Valley (PSU), there are ten students. At Lehigh, the classes are supported with Blackboard course software.

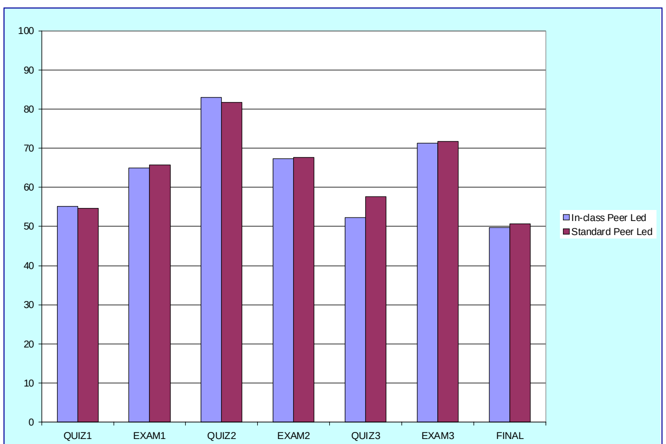


Figure 2. Quiz, Exam, and Final Mean Scores for In-Class Peer-Led Students Versus Standard Peer-Led Students - Spring 2004

<u>Study Protocol</u>

Groups of eight students were allowed to self-form: 50% of the students formed full groups, 30% formed as smaller groups, and 20% said they had no preference. The latter 50% were aggregated to full groups. At Lehigh, the meeting times (one to one-and-a half hours) were chosen by groups, which met in seminar-type rooms; at Northampton and PSU, the meetings were during lab times (one hour). Standard Peer Leaders were selected because they were good students with good personalities. In-class Peer Leaders were recommended by their introductory chemistry instructors, and they came entirely from "honors" chemistry classes as it turned out.

Standard Peer Leaders were paid \$500/semester, while In-class Peer Leaders were paid \$250/semester. Either a Standard Peer Leader or an In-class Peer Leader was assigned to each group. Equal numbers of peer leader types were used and over the two semesters reported here there were 43 groups. Various parameters of the PLTL method were kept constant between the two types and compared to the method employed in the PLTL community. The peer leaders received identical training (a nine-hour preliminary session followed initially by weekly meetings). Workshop time was one to one-and a half hours. Workshop materials were often those from *Peer-Led Team Learning: Organic Chemistry* (Kampmeier, et al., 2001) or were written locally. Attendance was in the 90% range inspired by attendance being 10% of the grade and workshop questions' appearance on exams. Groups selected the time of their meeting outside of regular class time

(Continued on page 14)

(evenings and weekends at Lehigh typically and during lab at Northampton and PSU).

Results

Comparisons of peer leader type are both academic and attitudinal. Academic results for Lehigh are seen in Figures 1 and 2 (previous page), showing the average student performance on exams and quizzes for the groups with the two peer leader types for Fall 2003 and Spring 2004. There is no significant difference between the two group types as seen in Tables 1 and 2. The student quality in the two group types was very comparable as determined by average GPA entering the course, Tables 1 and 2. The same is true for the Northampton students.

	In-class Peer-Led	Standard Peer-Led	Mean Difference	t statistic	df	Sig. (2-tailed)
GPA	3.266	3.146	0.120	1.56	125	0.122
Quiz 1	7.6	7.8	-0.22	-0.74	137	0.458
Exam 1	81.5	80.2	1.36	0.48	138	0.630
Quiz 2	5.1	5.2	-0.15	-0.35	132	0.730
Exam 2	57.2	59.2	-1.95	-0.77	134	0.444
Quiz 3	5.4	5.1	0.30	0.70	124	0.483
Exam 3	71.8	68.9	2.94	0.83	130	0.408
Final	72.2	70.0	2.19	0.76	129	0.447

Table 1. Data on GPA, Quizzes, Tests, Finals between In-Class Peer Led and Standard Peer Led Students-Lehigh, Fall 2003

	In-class Peer-	Standard Peer-Led	Mean Difference	t statistic	df	Sig. (2-tailed)
GPA	3.247	3.236	0.01	0.14	119.9	0.886
Quiz 1	505	5.5	0.04	0.08	125	0.938
Exam 1	64.9	65.8	-0.89	-0.28	125	0.782
Quiz 2	8.3	8.2	0.12	0.31	125	0.754
Exam 2	67.3	67.7	-0.35	-0.12	122	0.904
Quiz 3	5.2	5.8	-0.53	-1.28	113	0.202
Exam 3	71.3	7108	-0.46	-0.19	118	0.851
Final	49.8	50.6	-0.83	-0.36	117	0.720

Table 2. Data on GPA, Quizzes, Tests, Finals between In-Class Peer Led and Standard Peer Led Students-Lehigh, Spring 2004

A Student Assessment of Learning Gains (SALG) survey (Fall 2003) was conducted in collaboration with Vic Strozak [see page 16] and included the standard format with the addition of questions specifically designed to probe differences in peer leader types, both among students and peer leaders. There was no significant difference in the two groups for the vast majority of questions (84 of 95). To summarize the differences, Standard Peer students thought the workshops and peer leaders were more helpful to them and that the organization was better than In-class Peer students (SALG Questions D4, F4, 20, 30, and 31). Standard Peers answer questions more (53, 29) whereas In-class Peers act much more as a guide and meet with their groups more outside of regular workshop times. So the few places where there are differences seem readily understandable. The students prefer Standard Peers (59) and get answered more questions. The In-class Peers meet more but do not control them as well (they are largely with a group of students they know). The In-class Peers are actually following the rules of facilitating more than tutoring better than the Standard Peers because they don't know the answers. We do break one rule of the normal protocol in giving them answer sheets after the workshop. Both students and leaders strongly believe that does not detract from their efforts at working the exercises.

We are continuing this study this year (2004-2005) but the current bottom line in our opinion is that In-class Peers work just fine, increasing the pool of students that can be used as peer leaders and lowering the costs of the operation, whatever reward system is being used, in our case cash.

Keith J. Schray
Lehigh University
kjs0@Lehigh.edu

Originally presented at the 18th Biennial Conference on Chemical Education, University of Iowa, Ames, IA, July 2004.

Acknowledgments

W.J. Lademan and D. Gelormo, Northampton Community College; R.J. Egolf, Penn State-Lehigh Valley; and M.J. Russo, Lehigh University.

Reference

Kampmeier, J.A., Varma-Nelson, P., Wedegaertner, D.K.(2001). Peer-Led Team Learning: Organic Chemistry. Upper Saddle River, NJ: Prentice Hall Inc.

Piloting PLTL at Monroe C.C.

(Continued from page 9)

incorporate some time of leadership as I find it to be very rewarding."

Based on our experiences with PLTL in the first-semester general chemistry course at MCC, we believe that subsequent implementations should address the critical components such as organization arrangements and assigning one leader per workshop section. Such arrangements are crucial to the formation of a productive team.

J. Rick Kuempel
Monroe Community College
jkuempel@monroecc.edu

Lydia T. Tien
Monroe Community College
ltien@monroecc.edu

Originally presented at the 18th Biennial Conference on Chemical Education, University of Iowa, Ames, IA, July 2004.

Acknowledgments

Thanks to the Peer Leaders at Monroe Community College; MCC Institutional Research for providing historical performance data; and John Cullen, Chair of the Department of Chemistry and Geosciences.

What If A Critical Component is Missing?

(Continued from page 1)

those students who elect to participate—usually 30% to 60%. This is done either for lack of resources—financial, personnel for leaders, space; or, as mentioned, because of the belief or experience that not all students will profit from the workshops. Many sites have had success with this approach—in terms of student performance and overall satisfaction with implementation.

2. Involvement of the Professor The PLTL model recommends that the professor teaching the course participate in the implementation of workshops, for example, in the selection and preparation of materials, and in the training and supervision of leaders—meeting with them each week. This approach provides links among the students, workshop leaders, and professors, and tends to make the workshop a more significant learning experience. Some sites, to economize or because some faculty are more ready and willing to supervise the leaders, have arranged for the leaders of several sections with different professors be trained and supervised by one professor, sometimes assisted by an experienced leader. In these cases, the less-involved lecturers tend to view the workshops as useful but not critical to students' success, and when the workshops are threatened such lecturers are less likely to champion PLTL.

3. Training of Leaders The role of the peer leader distinguishes PLTL from other programs such as Supplemental Instruction, recitations, group study, and tutoring. The leaders are trained to see themselves not as teachers but as important facilitators of learning, working closely with the professor—becoming strong guides in the discipline and also advocates for the students. Learning and performing this role requires that leaders be carefully selected, and provided with training — weekly supervision that covers the material students are learning, pedagogical and group processing strategies, and the practical skills to handle people problems. While this need is made clear to new adopters, scheduling problems, professorial commitments, or a lack of conviction about the importance of on-going supervision leads PLTL programs to reduce the emphasis on weekly meetings, or hold meetings that leaders do not attend. The sense of a unified program is then lost. Each workshop depends on the skill, commitments, and industry of its leader. The leaders themselves lose their sense of belonging to a significant enterprise. Ultimately, the foundations of the program become so weak that continuance is problematic. Abandoning weekly leader meetings has been, in a number of cases, the preamble to abandonment of the program.

4. Appropriately Challenging Materials The model recommends materials that are challenging but doable, and appropriate for group work. The availability of ready-made materials published by Prentice Hall has made implementation of PLTL in General and Organic Chemistry somewhat easier than in other disciplines. But a majority of those using workshops make significant adaptations in order for the materials to fit the pace, emphasis, conceptual level, textbook approach, and other variables in the course. Students are quick to recognize it when workshop materials are not closely connected to the lecture and textbook. In addition, they are particularly bothered when the workshops do not seem to prepare them for tests. This expectation sometimes creates problems because most professors do not want the workshops to be simply drill and practice for tests. But instructors generally appreciate students' desires to improve their grades on the basis of workshop participation, and develop materials that develop concepts and enhance skills, along with abilities in creative problem solving.

5. Organizational Arrangements The time recommended for workshops is two hours. Ninety minutes can work, but when workshops are only an hour, there are generally complaints that students cannot spend the time on protracted problem-solving that is intended to be a key workshop experience, and the leaders find it difficult to keep up with the full reinforcement of the lecture material. At a number of sites, workshops have been scheduled with students from several lecture sections. This can work, but there are frequent complaints that the pace, emphasis, and manner of explanation can vary considerably from one section to another, making the workshops less effective.

The size of six to eight students in a group has been repeatedly emphasized. With fewer students, it is often difficult to develop group spirit; with ten or more it is difficult for a leader to keep in close contact with individuals and small groups as they work.

6. Administrative Support Although professors are free to select much of what constitutes a course—textbooks, material and format for tests, lecturing methods, etc.—introducing workshops requires approval, funding, and logistical support from another level, that of department chair, dean, and sometimes higher. When this support is strong, and the other components are in place, PLTL workshops stand a good chance of succeeding. When administrative support is weak, professors implementing the program feel they must struggle and beg for the necessities of implementation. Most administrators are in favor of more creative approaches to teaching and learning yet they are sometimes not able or willing to make the extra effort needed to obtain funding or fit workshops into the program of studies. The success or failure of PLTL is found in the details.

Leo Gafney
Leo.gafney@sbcglobal.net

The Workshop Project Newsletter

Progressions: Peer-Led Team Learning is a quarterly publication of the PLTL Workshop National Dissemination Project. *Progressions* is intended to build the Workshop community through discussion of the implementation of the PLTL Workshop Model at institutions of learning.

The editors would like contributions. Please submit announcements of upcoming events, articles, or pertinent concerns you would like addressed.

PLTL Workshop Project Coordination

Dr. David K. Gosser Jr.
Project Director
AE Dreyfuss
Project Manager
Dorothy Bozzone
Project Associate

City College of New York
Marshak Science Building
J-1024
160 Convent Avenue
New York NY 10031
Phone: 212-650-5704
Fax: 212-650-8339
Email: info@pltl.org

PLTL National Project Leadership

PLTL Project Center
City College of New York
New York, NY 10031
David Gosser, Department of Chemistry
gosser@sci.ccny.cuny.edu

Midwest Project Office
Workshop Project Associate Grant Program
Northeastern Illinois University
Chicago, IL 60625
Pratibha Varma-Nelson
Department of Chemistry, Physics & Earth Science
p-varmanelson@neiu.edu

Southeastern Project Office
Materials Development and Sustainability
University of Miami
Coral Gables, FL 33124-0421
Michael Gaines, Department of Biology
m.gaines@miami.edu
Joseph Griswold, Senior Associate
jggris@comcast.net

Western Project Office
Community Colleges Initiative
San Jose City College
San Jose, CA 95128
Madeline Adamczeski
Division of Mathematics and Science
madeline.adamczeski@sjeccd.cc.ca.us

PLTL Project Center for Research and Evaluation
City University of New York
New York, NY 10036
Victor Strozak
Center for Advanced Study in Education
VStrozak@gc.cuny.edu
Leo Gafney, Project Evaluator
leo.gafney@sbcglobal.net

University of Montana-Missoula
Missoula, MT 59812
Mark S. Cracolice, Department of Chemistry
markc@selway.umt.edu
Field Research & Theoretical Foundations

Associate Leadership
Ellen Goldstein
e.goldstein@att.net
Teacher Preparation Program

Dennis Bartow
dsbbyd@aol.com
Community Colleges Initiative

Jack Kampmeier
kamp@chem.rochester.edu
Publications and Institutionalization

The Six Critical Components of the Peer-Led Team Learning Workshop Model

- 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 tests, 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 so that the method has the opportunity to be adopted across courses and disciplines.