

PROGRESSIONS: PEER-LED TEAM LEARNING

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WHEN THE MONEY DRIES UP: WHAT'S A DEAN TO DO? HOW YOU CAN HELP YOUR DEAN HELP YOU

As Dean of Arts and Sciences at a public university, I experience daily the consequences of declining public support for public education. In our state of Illinois, for example, public funding has been cut some 16% over the last three years, while the number of students we serve has increased from 10,000 to 12,000. We are all increasingly tuition dependent, but tuition pays just a fraction of the costs of an education. My colleagues at private institutions fare no better; for many, their primary source of income is from tuition; they spend hours of their time ensuring that they will successfully recruit the next crop of first year students on which their budgets depend, and hours more raising funds from outside sources. In short, the budget crisis is real, and we are constantly

being asked to defer, to cut, and to prioritize.

The irony is that every dean was once a faculty member, with the same strong commitment to teaching, scholarship, and service that every academic has. In fact, in talking with my decanal colleagues, I have discovered that most deans decide to move into administration because they want to be able to have a helpful impact on the academic lives of faculty and students, and to make a mark on the institution. That said, sooner or later, the external funds for PLTL will dry up. The initial response of every dean is very predictable (with apologies to Elisabeth Kubler-Ross):

- Denial: "The money will never

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WHAT WE'VE LEARNED; WHAT WE'RE STILL TRYING TO FIGURE OUT

A PLTL-type model was introduced at the State University of West Georgia in the fall of 1998. It was used in only one section of the first semester of the chemistry course for allied health majors, with seven leaders conducting eleven weekly workshops for 90 students. Only one section of this course was offered and time for workshop meetings was carved out of class time each Friday. Some leaders could undertake more than one workshop because students were given a choice of meeting at the rather early regular class time or a later time. In 1999, as part of the plan funded by a National Science Foundation "Adopt and Adapt" grant*, the workshop times

were expanded to two hours in addition to class time, but participation was optional.

Fall 2000 saw the expansion of the program to all sections (except the honors section) of introductory chemistry. Again, participation was optional. A sufficient number of leaders had been recruited, times when they were available for workshops had been worked out, and available rooms had been secured at those time. Each instructor in the introductory chemistry sections had agreed to allow the workshop to count for 10% of the course grade for those students choosing to participate. On the first day of class the workshop op-

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PROJECT NOTES: KEEPING ON MESSAGE

Much is made about how political campaigns have to “keep on message” to succeed and thrive. For instance, with the 1996 Clinton presidential campaign it was, “It’s the economy, stupid.” If one takes a less cynical view, keeping on message is encapsulating the essential core to help keep the focus on the goal (e.g., “Keep your eyes on the prize”). With Peer-Led Team Learning, the model is so inclusive that it can accommodate many different perspectives. But at the very core of why it has spurred such enthusiasm and thrived is a consistent belief that students are partners in an educational venture and they have a valid point of view that needs to be listened to and respected. PLTL is the best vehicle I have seen that accomplishes that. By working with student leaders to help them conduct workshops, we are opening up an entirely new dimension of energy and accomplishment in teaching. We are breaking down a sense of isolation, powerlessness, and alienation both for the students and ourselves. By inviting student leaders to present at meetings and conduct workshops for faculty, we are placing our confidence in their abilities, and we have not been disappointed.

Another aspect of the growth of PLTL, aside from the core idea of peer leaders, was the development of PLTL as an authentic team effort. It has been amazing to see how a very diverse group of individuals, with completely different styles and skills, came together in a very

focused manner around a single goal, to disseminate PLTL.

Why [PLTL] has spurred such enthusiasm and thrived is a consistent belief that students are partners in an educational venture and they have a valid point of view that needs to be listened to and respected.

As the number of affiliates adopting PLTL has grown, one challenge that this growth has had to deal with is how can a team-based project grow beyond the scope of a single team? How can it tap the enthusiasm of a team?

As we look to the future, seeking to learn more about PLTL through cognitive research, to develop interdisciplinary workshops, to bolster institutionalization, develop leader training, come to grips with technology, and other challenges, it is my hope that we do not lose the essential elements that brought us this far!

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This issue of *Progressions* contains material drawn from the 2004 Peer-Led Team Learning Annual Conference held in Chicago, Illinois. Articles are based on presentations made, as well as from “white papers” submitted for the conference proceedings. This issue focuses on the themes of “Leader Training” and “Peer Leadership and Research.” Faculty, learning specialists and peer leaders submitted ideas. In some cases, a description of campus activities allows this issue to show snapshots of local PLTL program, which are treated here as profiles.

Articles based on presentations have the author’s name, campus and e-mail at the end, in the standard format used in *Progressions*. Materials drawn from “white papers” contain the names, departments (or majors) and campuses of the authors. Their authors’ e-mails follow:

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PEER LEADER TRAINING AT WASHINGTON UNIVERSITY

The Faculty Viewpoint

At Washington University (St. Louis, MO), all of our peer leaders take a one-credit general-studies course called Seminar in Academic Mentoring (SAM) during the first semester in which they are peer leaders. The SAM course meets one hour per week in a multi-disciplinary group in which teaching methods and group techniques are presented. Currently, the instructor of this course is an instructor of the general chemistry course, which uses PLTL study groups, as well as the director of the university's teaching center. This course was developed and given for the first time last fall (Fall 2003) and the participants were the chemistry peer leaders. This year, the participants in the course include chemistry, mathematics, and physics peer leaders. There are two major goals of the course: One is to provide an opportunity for the new peer leaders to discuss openly with each other current concerns they have in the facilitating of their groups. The second is to discuss different teaching and group dynamics topics and to learn to apply these topics to the leaders' individual PLTL groups.

The course covers the following topics: preparing for a PLTL workshop (especially the first one), discussing the philosophy of the PLTL model, handling different situations, managing group dynamics, encouraging participation, using questioning strategies, acknowledging different learning styles and diversity issues, listening, promoting active learning, and self-evaluation of the peer leader role.

The peer leaders write weekly two-page reflection papers, a two-page self-evaluation paper, and a group project. The group project is the creation of a book containing a collection of essays written by the peer leaders on a specific topic. In the last third of the semester, the peer leaders collectively choose a topic on something they have learned this semester as peer leaders, which they would like to pass on to the new peer leaders. The book is then given to the next year's new peer leaders at the beginning of the

semester. Last year's SAM class wrote on "the greatest challenge as a peer leader." This year's SAM students read that book this fall before their first PLTL workshop and wrote a two-page response paper. It was a successful endeavor for both sets of peer leaders. It was a culminating experience for the writers and an eye-opening experience for the readers.

Developing the course was time-consuming, because it was difficult to find examples of extensive peer leader training and in-depth materials on different teaching topics developed specifically for peer leading. It would be helpful if there were different syllabi and materials readily available online to adapt. These materials could be in a database that instructors using PLTL could access. It also would be helpful to offer a workshop for the instructors of such courses to present ideas about how to train peer leaders in the topics of teaching and group techniques.

Judging from last year's course evaluations and written comments, our peer leaders' training course has been successful. Last year's SAM class gave excellent evaluations to the course and said that they felt better prepared as peer leaders because of this course. Some of the leaders last year were second-year peer leaders and therefore had attended a two-day workshop as training the previous year. All of these second-year peer leaders felt that the semester-long course was still very helpful and better prepared them as leaders than the two-day leader-training workshop had done.

*Regina Frey, Susan Hockings, Lisa Kuebne
Chemistry Department
& Jason Woods
Physics Department
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The Peer Leader's Viewpoint

Three years ago, PLTL was first launched at Washington University in General Chemistry. The popularity of this program has led to enormous growth each year. This success has led to PLTL programs in calculus and physics as well as an unprecedented enrollment in PLTL in General Chemistry. Our group would

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*The group project
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semester as peer
leaders, which they
would like to pass
onto the new peer
leaders.*

(Continued from page 3)

like to learn how PLTL is done at other schools and share our own experiences. Information exchange at conferences is a vital part of improving individual PLTL programs. In fact, past attendees from Washington University have brought back many interesting ideas, some of which we've even put to use -- role playing among group leaders to practice group management, for example.

PLTL leaders are a vital part of the program. Their development is key to the success of the program. Support could include building on the PLTL leaders' interest in teaching by leading workshops. This may help meet the program's popularity despite the size constraints as well as encourage the development of PLTL leaders as future professors and teachers. In addition, PLTL leaders could be involved in research and publication, using these to disseminate PLTL. Moreover, these efforts would aid in sharing the practices and techniques used in individual programs with the national body of participating schools.

Some questions that all of us could help address include:

1) *How do other schools handle the volume of interest in the PLTL program?*

Our program has grown enormously every year. This year is no exception. Three hundred students came to our info and sign-up meeting, more than any other year. With this level of interest, PLTL groups have been enlarged to an unprecedented nine students each. Therefore, group and program size are concerns that we face this year and in the future.

2) *How do other leaders move efficiently through the four stages of group development?*

All the leaders have now learned about "forming, storming, norming, and performing." Still, everyone may run into rough spots through the group development process. Furthermore, larger groups this year require sharper

skills from us leaders.

3) *What group learning and maintenance techniques do other leaders use?*

We are always interested in helping students learn the material as well as possible. Since each individual is different, the more ways we know of teaching something, the better we can help students learn.

Currently, the Washington University PLTL program in General Chemistry trains group leaders by teaching group management skills and problem-solving skills in weekly classes. Leaders write reflections on their weekly tutoring sessions, addressing any problems they had and how they resolved them or what they could do differently next time. Leaders have opportunities to observe other leaders teach PLTL groups as well as practice their own skills with a group of leaders before working with students.

Through my peer leading experience, I have worked out a method to help students understand the tasks, and be prepared to do problems even if they have not had enough practice with homework or in class.

1) *Go over key concept for the problem before doing the actual problem.*

2) *Walk the students step by step through the problem if they are confused.*

3) *Mind students' personalities while doing 1 and 2. If they are sensitive to being put on the spot, talk them through a smaller task, so they do not become flustered. If they need more time to work the problem, talk them through a smaller task, and ask the group to help when appropriate.*

Step one is particularly important because it saves time and prevents frustration. Things we learn from each other can make everyone a better PLTL leader and further strengthen our popular program.

*Rui Guan, Peer Leader
Washington University
Department: Chemistry*

CCNY AWARDED \$1.3 MILLION HHMI GRANT

The City College of New York (CCNY) has been awarded a \$1.3 million grant by the Howard Hughes Medical Institute (HHMI) to boost science education and encourage more minorities to pursue scientific careers. According to Dr. David K. Gosser, Jr., Professor of Chemistry at CCNY and the HHMI Project Director at the School, the project will bring the excitement of interdisciplinary research to undergraduate students at CCNY and program partner Bronx Community College.

In their freshman year, students will learn science and engineering using the innovative peer-led team learning model, where students discuss, debate, and engage in problem solving activities under the guidance of a peer

leader. Students will then have the opportunity to participate in an intensive four week summer bioinformatics workshop that introduces them to this exciting new interdisciplinary field. In their sophomore year, students will learn in a laboratory-based course "Biomolecular Systems" that bridges coursework and research. Subsequently, the students will be supported and mentored in research with CCNY faculty and collaborating research hospitals and institutes. With support from the HHMI grant, a new *Gateway Laboratory for Undergraduate Research* will be established, a dedicated research training facility that includes state of the art instruments for protein synthesis and molecular biology.

ENHANCING THE TRAINING OF PEER LEADERS: FOUNDATIONS AND INNOVATIONS

The Faculty Viewpoints

University of Portland (OR)

Peer leaders need training in both the content material and in the pedagogy. Most of the training attention thus far has been focused on pedagogy, presumably because that is a more general topic; the subject matter is obviously different for every course, while most teaching methods can be applied in a wide variety of contexts. Yet, although peer leaders are typically upper division students who have done well in the course before, my experience has been that they do need added training in the technical details. And although the specifics (and therefore the details of the training) differ from course to course, there may be some generally applicable approaches that make for more effective content training. I would welcome a discussion of these possibilities.

Peer leaders also need ongoing training in teaching methodology, which has indeed been addressed in the literature, but on many campuses the training is often concentrated during a brief period at the beginning of a school year. This is a start, but ongoing training is also needed during their involvement, as they encounter new questions and new situations so that the training is immediately in context. The greatest problem in achieving this ongoing training, and with providing training in both content and pedagogy, is time. Time is in short supply for both the peer leaders and the faculty, and schedules often make it difficult to coordinate additional meetings during the school year.

From an institutional point of view, training also poses an added financial problem. It is already difficult to adequately fund peer leaders, at least if peer leading is a paid position as it often is. Paying for additional time for training is even more difficult. I do not have any simple answers to these barriers. One way to provide some support would be to compile discussions of typical difficulties that might be expected, and effective strategies for addressing these problems. Adding these to the existing collection of workshop materials would at least save the faculty some development time for training, and the materials can be made available to peer leaders as an added resource that they can access as they need it.

*Tamar More, Assistant Professor
Departments: Physics & Mathematics and Statistics
University of Portland*

Virginia Military Institute (VA)

As a PLTL novice, I found the area of leader training daunting, in part because I recognized the importance of

this component of the model. I had the good fortune of making the acquaintance of Dr. Dennis Bartow, who not only came onsite to present information workshops for prospective faculty and workshop leaders, but offered to return to conduct training. An unexpected move prevented him from doing so, but this became a blessing in disguise, since it led to my attendance at the City College of New York orientation for workshop leaders. I received institutional funding to travel to the “epicenter of PLTL,” and returned armed with knowledge, materials, and energy that I applied to construct my own training program!

Since the quality of leader training is critical to the success of the program, it would be very helpful for experts to provide either on-site or remote training to either leaders, faculty, learning specialists, or any combination of these. The website already has a wealth of information that could help identify potential trainers, and perhaps additional names could be added to this list, sorted by region. The newsletter is another possible method for disseminating this information. Travel funding could be a barrier, but likely not a significant one if regional trainers are cultivated. Trained trainers would continue to increase the pool. As we all know, reading about and implementing programs tend to be as different as night and day, and providing training support may well tip the scales for institutions that are considering PLTL pilot programs.

*Anna Crockett
Director, Miller Academic Center
Virginia Military Institute*

State University of West Georgia (GA)

PLTL could be developed in the area of leader training by having much more extensive exposure of new leaders to model workshops. This could be accomplished by one or more of the following methods:

(a) Partnerships whereby institutions newly adopting PLTL could be paired with nearby institutions with established PLTL programs. New leaders could visit the workshops at the institution with an established program. Also leader trainers from the established institution could visit the new institution.

(b) A cadre of professional leader trainers could visit PLTL institutions, both new and established, and conduct leader training programs.

(c) A set of training videos could be developed. I have seen several videos featuring workshops but essentially they are all “public relations” efforts. They extol workshops but show very little of what goes into making a successful workshop program. Much more useful for leader training

would be videos that show more than just snatches of workshops in progress. There should be a narrative voice-over that does the following:

- i) points out techniques leaders are using,
- ii) comments on situations that leaders are handling,
- iii) shows other leaders handling the same or a similar situation differently,
- iv) discusses the pros and cons of the different leader strategies,
- v) describes how the leader is or is not following the PLTL model,
- vi) carefully explains how the workshop shown in the video applies constructivist theories of learning, how the students are being led to use metacognition, and other ways in which the PLTL workshop model fits into learning theory and accommodates various learning styles.

*Lucille Garmon, Professor
Chemistry Department
State University of West Georgia*

University of Portland (OR)

After six years of implementation of Peer Led Team Learning at the University of Portland, we have developed a training manual that works well for an integrated training session of biology and chemistry peer leaders. This combined training session is scheduled for the first Friday afternoon and Saturday morning during the Fall semester. For us, this corresponds to Labor Day weekend but is the best time for us to schedule this so that new peer leaders are ready when their workshops start.

The material in the manual is structured so that the first day addresses various approaches to group work and theories of learning and learning styles. The first day concludes with an assignment for each participant to determine his or her learning style from a web site provided and to bring it for the second day session.

The second day begins with the students displaying their learning styles on bar graphs on the board. The diversity of learning styles within the group of peer leaders is discussed. The groups are further split into discipline-specific groups and work on introducing concepts in biology or chemistry using approaches that are other than their “preferred” learning style. In our training session this Fall, this resulted in some very humorous and creative kinesthetic examples. The session concludes with a panel made up of experienced peer leaders who answer questions submitted by the participants. Assessments of the training sessions have consistently found the panel very popular and helpful. The afternoon on the second day is reserved for break-out sessions with individual instructors and their peer leaders.

The manual that we have developed is available on the PLTL website (under Leader Training, Orientation).

We would welcome any improvements that users may suggest.

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Chemistry Department
University of Portland*

*Becky Houck, Professor
Biology Department
University of Portland*

The Peer Leaders' Viewpoints

The City College of New York (NY)

The PLTL model, being adopted by many colleges and universities, and enjoyed by a majority of students, still lacks faculty involvement. Many professors refuse to come to the workshop preparation meetings, saying that they don't have time for it. Not knowing exactly what the professor expects students to know, the leaders are getting discouraged and lose the motivation in solving the problems. Leaders tell me sometimes: “There are so many sub-topics in the book, we are not sure if the professor wants students to know all of them or if he is skipping some. There is no point to struggle in the workshop if he is not covering it in the lecture anyway.” I just want the professors to know that 30 minutes a week that they spend in the workshop prep will benefit both leaders and students, and will definitely increase the overall level of performance in the workshop and on an exam.

This semester we actually made many significant changes to the Leader Training routine. Besides the Education class that new leaders take during the first semester that they lead a workshop, they are exchanging ideas and concerns with the experienced leaders during the workshop prep. Also, I asked the coordinators to start looking for possible candidates for the coordinator position. I would like to start training future coordinators before they take the job, because I want them to be prepared and ready for the challenges of being a workshop coordinator.

*Oleg Survillo
Chemistry Department Workshop Coordinator
The City College of New York*

Miami University, Ohio (OH)

I am a new peer leader this year, so my point of view probably differs from the experiences of the other older fellow peer workshop leaders. I can say that at the moment I am still feeling lost sometimes and I would need also some additional sources that would help me to lead the group and to understand the students.

So far I have found that the weekly meetings of the workshops leaders are really helpful. However I would appreciate if each of the meetings had a separate topic to discuss, for example, dealing with shy students, having authority or motivation. In my class I think that we just spend too much time talking about how the last session went and I do not gain too much from that. I also found out that other people's experiences help me the most.

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PLTL IN ORGANIC CHEMISTRY AT ALMA COLLEGE

The implementation of Workshop Chemistry at Alma College (Alma, Michigan) is an interesting case study given the “non-traditional” freshman/sophomore organic chemistry sequence as well as the organizational interdisciplinary nature of the PLTL “staff.” The core chemistry curriculum at Alma College consists of four consecutive courses: Introductory Chemistry: Chemical Analysis (CHM 115), Organic Chemistry I (CHM 223), Organic Chemistry II (CHM 224), and Inorganic Chemistry (CHM 230). CHM 115 serves as an introductory chemistry course facilitating the transition from high school to college chemistry—basic principles of chemistry are presented within a context of chemical analysis and supplemented by consideration of the role of chemistry in modern society. Students begin the organic chemistry sequence in the second semester of the first year, continue the sequence in the first semester of their second year, and complete the core curriculum with the intermediate inorganic chemistry course.

The impetus for the implementation of PLTL Workshops in the organic chemistry sequence was a Multi-Initiative Dissemination (MID) Project Workshop Cubberley attended at Central Michigan University in April 2003. The MID workshop provided a wonderful opportunity to exchange ideas with Shaun Murphree and Nancy Lowmaster, from Allegheny College (PA), recipients of a Workshop Project Associate grant. When implementation was first considered, one potential obstacle was the availability, or lack thereof, of a “learning specialist.” However, a social psychologist at Alma College with a background in small group dynamics and Vygotskian theory turned out to be enthusiastic about filling that role in Workshop leader training. We believe that experiencing the exchange of views between a chemist and psycholo-

gist provides Workshop leaders with a model of the interdisciplinary conversation that occurs in liberal education. Collaborating with a colleague from a different discipline also provides the PLTL faculty members new perspectives on teaching and learning.

One advantage of the College’s curriculum is the opportunity to offer seven weeks of leader training immediately before the first term of CHM 223. In this first year of PLTL, Workshop leaders were recruited over the first half of the Fall 2003 semester and trained over the second half. Weekly meetings throughout the year (Spring 2004, Fall 2004) provide support for student leaders and focus on Workshop logistics and content. This term (Fall 2004), training sessions for new Workshop leaders will constitute a two-credit, second seven-week course (pending faculty approval). The recent article by Tien, Roth, and Kampmeier* has been a valuable (and timely) resource in the development of this course. The leader training course will have a timeline that permits discussions of the cognitive and pedagogical issues of group leadership without sacrificing the sense of urgency associated with leader training that occurs immediately preceding the semester in which the students will be leading Workshops. In addition, the timing of the course provides opportunities for vocational apprenticeship between current and rising Workshop leaders—new leaders can “shadow” current leaders.

*Mark Cubberley & Carol Slater, Professors
Chemistry Department
Angela Zischke, Peer Leader
Alma College*

* Tien, L., Roth, V., Kampmeier, J. (2004). A course to prepare peer leaders to implement a student-assisted learning method. *Journal of Chemical Education*, 81,9, 1313-1321.

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I would also suggest a special format of meetings where students would meet separately and discuss the material covered in the workshop book. That approach would help leaders to find out their weak spots in their knowledge. I think that leaders should solve their problems first in the peer workshop book by themselves and then compare their answers. That would prevent the leaders from making too many mistakes while working with the group of students.

On the other hand, I also think that much more can be done to improve the communication between the leaders. I found out that the leaders do not know each other very well and that they do not communicate very

much outside of the weekly meetings. I think that the best way to solve that problem would be finding out what the students have in common. For example we could be having dinner sometimes or go to the cinema together.

I liked that our teacher passed out the sheet of paper with phone numbers. Sometimes when I have a need to talk about current issues that arise in my workshop, I can give a call to one of the leaders. That helps me solve the current problems in the workshop and talk about my feelings and attitudes. I think that it is a generally good idea to have somebody to contact when the need arises. I would suggest having a special web page where peer workshop leaders could be asking questions and the other workshop

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PLTL IN CALCULUS I AT THE UNIVERSITY OF MAINE

Based on the experiences of faculty and students who had participated in Peer-Led Team Learning in other departments at the University of Maine (Orono, ME), we expected that the effectiveness of student leaders was critical to the success of students who were involved in a PLTL effort. During the spring of 2004, we experienced this first hand, as we implemented Peer-Led Team Learning in two sections of Calculus I. We observed excellent student leaders succeed at working through difficult material with students who were struggling. We also found that the best workshop has little chance of success if the student leader is not effective in facilitating the group dynamic. It is therefore critical that the process of recruiting, hiring, training and supporting student leaders be central to any Peer-Led Team Learning project.

Consider the following quotes taken from leader journals, after completing Workshop 3, *Relationship Between a Function and its Derivative*. One leader writes:

“...I started to really pay attention to what one of the students was doing. He was just tracing his graph over and over again and not plotting the derivative. I realized that this is exactly what I used to do when I didn't understand something. Everyone else is moving along and you don't really want to bother them by asking for help so you kind of pretend that you understand the material. I asked the student if he needed help and he immediately said, 'Man, I need help bad.' I started to explain it to him, but then I asked a member of his group to do that instead, which he did very well...I am always really amazed what sort of ways that other students come up with to view a certain concept. They are all so different from each other and different from mine.”

Contrast this with excerpts from a second leader's journal:

“...I think the group as a whole was a little confused...Once two of the five groups (pairs) asked me the same question, I decided to explain it to the whole group. So I did some board work.... I also put up my version of $P(x)$. I wanted them to be able to see that there is more than one answer. A couple of students

hazarded a guess as to why, but I think they were feeling the need to leave by then. They actually began packing up on me!!!”

Not surprisingly, end of semester student evaluations reflect the very different experiences:

Q: My group leader was effective at facilitating the group:
1 (strongly agree) - 5 (strongly disagree)

Average response of students:

Leader 1: 1.3 Leader 2: 3.4

Q: The PLTL session was more beneficial than an extra hour of lecture:

1 (strongly agree) - 5 (strongly disagree)

Average response of students:

Leader 1: 2.0 Leader 2: 3.1

Both of these leaders were excellent Calculus I students and were highly recommended for the peer leader position. Leader training for both included exercises and discussion designed to develop their skills as group facilitators. For Leader 2, this was not sufficient.

In mathematics, our training sessions principally focus on a discussion of the previous week's workshop experience, followed by preparation of the next workshop using the model of a PLTL group. Although generally effective, this weekly training leaves largely unaddressed the support of leaders who are struggling as group facilitators. Given the small number of student leaders (8) in mathematics, a leader experiencing difficulties can feel extremely isolated. Since PLTL has been effectively implemented in other departments at the University of Maine, interdepartmental training could focus on group leadership skills. This training would be used in addition to the existing weekly training sessions. Currently, there is no mechanism for providing interdepartmental training; this would need to be developed. Resources would need to be allocated for the development and implementation of this model. In addition, participation would require a greater time commitment from the peer leaders, and possibly additional compensation.

Susan McGarry, Paula Drennany & Jen Tyne
Lecturers

University of Maine, Orono

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leaders and teachers would be answering them.

Finally, I think that workshop is a really good idea. It has helped me a lot in my own classes. I started to like group working in my own classes because it is a great opportunity to learn from other classmates. I started to understand that every student sometimes struggles with

classes. For me it is very important to ask for help when a concept is unclear or if I do not know how to do a problem. The workshop is a real life experience where both leaders and their students can benefit.

Melita Pavlinic, Peer Leader
Miami University – Ohio
Department: Chemistry

PHYSICS AND CALCULUS UNITED AT THE UNIVERSITY OF PORTLAND

For the past two years, one section of introductory physics and one section of first year calculus at the University of Portland (Portland, OR) have been linked in a tightly integrated program using peer leaders as a fundamental part of the program implementation. Our goals are to improve conceptual understanding and retention for students in mathematics and physics; to promote the ability of students to apply knowledge in an interdisciplinary context; to improve student satisfaction with and interest in mathematics and physics. To address these goals, we have implemented the following strategies:

1. integrating calculus and introductory physics curricula and learning environments;
2. engaging students in active discovery and fostering group learning;
3. using technology to deepen the connection between physics and math and to empower students to explore mathematical and physics concepts;
4. implementing peer mentoring by adapting the Peer-Led Team Learning model.

The integration is realized in three ways: syllabus design, pedagogy, and classroom design. In terms of content, we take full advantage of the integration by organizing the course around ‘threads’ in which the subjects reinforce and motivate each other. This goes beyond a “just in time” approach in which mathematics is often subordinate to physics. By carefully timing the math and physics content we take advantage of the opportunities each subject has to motivate and reinforce the other.

Both the physics and the math sections have a large workshop component in which students discover and explore the material in small groups with the assistance of peer leaders. In term of class structure, students work in small groups at stations designed to promote interaction within and among groups. Peer leaders, each taking charge of three groups of students, maintain and encourage student interest and focus on conceptual understanding through a Socratic questioning dialog.

Finally, in terms of the classroom, the stations incorporate a seamless interface with technology. The course is taught in a dedicated classroom with workstations, each serving one student group, and each with a computer networked to the other computers in the classroom. Mathematica provides a powerful set of software tools available simultaneously for both mathematics and physics. Using experimental tools and hands-on activities, students discover physical principles and model mathematical concepts, actively constructing their own knowledge. In physics, this common set of tools supports the use of recently acquired mathematical skills, while in mathematics the connection to physics drives deeper conceptual understanding of the mathematical concepts.

The sections have the same students, meet in the same room, and the math and physics syllabi are carefully coordinated. The student groups and the peer leaders are the same across the math and physics sections whenever possible. The workshop approach and the peer leaders have proven to be two of the most successful elements of the course and key components of the integration.

The threads that weave through both sections of the integrated course, throughout the semester, are supported by in-class workshops and integrated homework assignments. In the first semester, the threads include limits, vectors, derivatives and rates of change, the Riemann sum and total quantity, the fundamental theorem of calculus, and graphical interpretation of functions and physical behaviors. Second semester threads continue many of these, including vectors, Riemann sum and total quantity, and the mathematical and physical interpretations of the fundamental theorem of calculus. We also add threaded activities on modeling, on using differential equations, and on approximations.

As examples, we present here some details from one of the threads: the physical and mathematical interpretation of the fundamental theorem of calculus. The work energy theorem becomes a physical example of the

(Continued on page 10)

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The greatest value of the PLTL model is the opportunity it provides students to make connections with other students, and to make students aware that they don't have to be a mathematics or physics major to enjoy the class and to realize that they can succeed if they try.

"I never realized how much fun teaching was. I was always the kid in the back of the class making fun of the teacher."

(Continued from page 9)

mathematical statement of this theorem. In lab, students measure both the force on a cart as a function of position and the cart's kinetic energy. Traditionally, this serves to demonstrate the validity of the work-energy theorem. In our integrated course, it also serves as the basis for a discussion of the fundamental theorem of calculus and a review of the Riemann sum as a total quantity. The thread continues in the first semester as the idea of area integrals is developed using a Mathematica lab in the calculus class, followed by the application of the same lab in the physics class for calculating moments of inertia. In the second semester, we pick up the thread when finding the electric field generated by a line charge. Usually an argument for the validity of the method makes reference to the concept of Riemann sum which "you all remember from calculus." But, in an unintegrated physics and calculus sequence, perhaps the students haven't had it in calculus yet, or perhaps it wasn't emphasized, or no connection was made to a physical model of a Riemann sum. Our integrated syllabus and classroom make possible important improvements of this unfortunate (and common) situation. The physics instructor knows that the students are familiar with Riemann sums and integrals because they studied these topics just the previous week. Moreover, one of the motivating examples is the exact line charge problem that the students are faced with in the physics lab. Strengthening the connection is the repeated use of a common software tool (Mathematica) to calculate and visualize the Riemann sums. Using Mathematica, students can also explore refined Riemann sums, reinforcing the important concept of the definite integral as a limit of Riemann sums, and a broad range of charge distributions and field locations.

The peer leaders are involved in most of the physics sessions and about half of the mathematics sessions. Each of our peer leaders works with three groups, each consisting of three or four students. This differs from many other implementations of the PLTL model in which peer mentors work with single groups of six to eight students. Whenever possible, each student group works with the same peer leader throughout the semester and across both components of the course. This is impor-

tant in that it strengthens the connections between the subjects and builds social relationships vital to success in the course. The experience of faculty at the University of Portland and other institutions has been that the social relationships built between students and their peer leader and among students sharing a common peer leader have been very valuable in terms of student satisfaction, interest, and success in the course.

The impact of the peer leaders on the course, and of the experience on the peer leaders themselves, was evaluated through several interviews. Both the peer leaders and the students reported that they felt that the peer leaders added a component to the class that a professor could not. In particular, students felt like they could relate better with the peer leaders because they were closer in age to the students and had just been through the class. The peer leaders indicate that perhaps the greatest value of the PLTL model is the opportunity it provides students to make connections with other students, and to make students aware that they don't have to be a mathematics or physics major to enjoy the class and to realize that they can succeed if they try. An interview with a peer leader revealed the importance that the peer leader placed on making connections with students and helping students learn the material. The peer leader also reported a new appreciation of teaching, and a new attitude toward both teaching and learning: "I never realized how much I like to teach. I never have before, it's just really fun to...to walk up to someone who has a question and be able to help them. I never realized how much fun teaching was. I was always the kid in the back of the class making fun of the teacher."

*Tamar More
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FROM PEER LEADERSHIP TO RESEARCH

The Peer Leaders' Viewpoints

University of Houston-Downtown (TX)

I think that if PLTL would help get students involved in student research, it would be very beneficial to all the students and help them build their career as an undergraduate. PLTL could hold an internship/job fair that brought in representatives from different institutions or companies. Also, PLTL could get in contact with students who were a part of PLTL in the past to recruit in their fields and talk to students about how PLTL helped them get where they are. PLTL could provide speakers to discuss the importance of undergraduate student research.

The only barrier that I could think of is that the students would not be interested in student research; however, I find that very difficult to happen since undergraduate research is very beneficial to them and it looks good on a resume and on graduate school applications.

*Jennifer Bustos, Peer Leader
University of Houston – Downtown
Department: CMS*

The City College of New York (NY)

In the beginning of this semester I was lucky enough to be invited to a presentation sponsored by the Chemistry department at CCNY of all the new Chemistry professors. At this meeting, the faculty each gave a 15-minute talk on their research and answered any questions. I was the only undergraduate in the room and I wondered why. It was a totally engaging experience, and even though I didn't understand about half of the science, the good part was that I understood the other half.

At this institution there are a number of undergraduate students who are working in labs, not just in the Chemistry department but in all the science departments. They are working either through volunteer work or independent study for credit. I think it would be great to have them meet in a workshop, present their work to other undergraduates and answer question. For me this is a perfect moment for the workshop model. It would give students experience with communicating science work, formulating and sharing ideas.

This kind of arrangement would need unified support from at least the level of the science faculty. It could start informally and easily if mentored by one faculty member who could attend.

*Heather D'Adamo, Peer Leader
The City College of New York
Major: Pre-med*

"Give a man a fish and he'll eat for a day, teach a man to fish and he'll never go hungry again." Peer-led team learn-

ing is an excellent model to catapult students into research opportunities in interdisciplinary fields. As leaders are trained, they are required to investigate topics on ideas in learning, group dynamics and information processing. These skills are critical not only in developing capable leaders, but also useful in doing scientific research. A student who understands group dynamics can work very well on a research team and even lead its organization much like he or she does in a workshop. Also information processing is essential when gathering a mass of data, which often takes place in scientific investigations, especially in Biology. The PLTL project is ideal when it comes to getting students to participate in research; it incorporates the skills necessary for a scientist to have with the skills that are essential to a workshop leader, ultimately sharpening both aspects for the student.

In order to help PLTL support its leaders in research endeavors, which will help them achieve their goals in science, as well as in their workshops, funding must be obtained. The NSF National Dissemination grant can help set up workshops in participating schools; however, an accessory source of funding would be needed to fund individual students who wish to participate in interdisciplinary research (biology, chemistry, physics, etc). This alternative source could come from scientific foundations like the National Science Foundation (NSF), the National Institutes of Health (NIH), and NASA. These organizations, as well as others help support student involvement in research projects. The peer-led team learning model can be used to link a university's research programs, by using trained peer leaders (who have good research skills already) to join research groups that they may be interested in and who have this alternate funding already. Also most research professors benefit from having undergraduate students in their groups because they receive additional funding for having students involved in their research.

The only barriers that may appear are the time commitments involved with research. In chemistry and physics, time is not entirely a crucial factor, as successive experiments can be carried out at one's leisure. However, in biology time is usually very important because you are dealing with live material, which may have a certain life expectancy. Also in community colleges, there may be not many research professors available, as the student turnover rate is high.

*Marven Lamarre, Peer Leader
The City College of New York
Major: Biochemistry
(Continued on page 12)*

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The Faculty Viewpoint

Coastal Carolina University (SC)

This is my third year coordinating PLTL Workshops in Introductory Biology at Coastal Carolina University (CCU). The program began with a WPA Grant in 2002 and we are continuing it for our first semester students. I have been able to combine PLTL with student research projects as well as future teacher preparation through my own research focus on science education.

My position as Assistant Professor in the Department of Biology at CCU was our first hire in the College of Natural and Applied Science with a specific directive to focus on research in science education. CCU also has an emphasis on undergraduate research, with faculty expected to involve students in their own research. PLTL offered a good opportunity to do this, since I was collecting survey data to assess the effectiveness of the program in Introductory Biology.

In Summer 2003, I taught a graduate course for our Master of Arts in Teaching (MAT) Program and thereby got to know some of our graduate students who were planning to be teachers. That Fall semester, two of the MAT graduate students and one undergraduate student interested in science education approached me about possibly working on research in science education. I had all my PLTL survey data, but had not had a chance to really look at it, so I basically handed it over to these students with the charge to write up the study and report on what kind of impact PLTL was having on our students. That Spring semester, another undergraduate planning to become a science teacher asked about similar research possibilities, so I gave him the initial student report and the next semester's worth of data. His charge was to incorporate the new data and put together a presentation for the annual meeting of the South Carolina Academy of Science in Spring 2004.

This has been a win-win situation for everyone. I've had assistance in compiling, analyzing, and presenting my data. Four students, two of whom are now high school science teachers and two of whom are considering that career choice gained experience in conducting and communicating research in science education. While this did not give them teaching experience directly, it did give them research experience which they may be able to apply in assessing their own classroom programs or graduate work. It also introduced them to the PLTL program in general, which could be used in some form in a high school setting.

I think the main barrier to this type of program is the idea that research in science education does not quite "count" as real science research. However, I think that barrier is going away, at least here at CCU. Since I was hired, we have hired two chemists whose focus is also science education. None of us has made it through the tenure process yet, but my sense is that most of our faculty now supports this type of research.

As far as support, certainly having a student symposium become part of the annual PLTL conference would be helpful. It's easier to convince your administrators to pay for student attendance at conferences when the students are presenting. Secondly, it would be helpful to have some sort of mini-travel grant program to facilitate student travel for presentations elsewhere. This not only gives the students valuable experience, but also helps to disseminate the PLTL program.

*Sharon Gilman, Assistant Professor
Biology Department
Coastal Carolina University*

MULTI-CAMPUS INITIATIVE: PLTL IN LAB

A study* by Drs. Leo Gafney and Pratibha Varma Nelson on Saint Xavier students noted that when former leaders were asked to rank the factors impacting their learning, lab work was not anywhere near the top. Northeastern Illinois University, along with partners at Purdue University, University of Illinois at Chicago, College of DuPage, Harold Washington College, Moraine Valley Community College, Olive-Harvey College, and Ball State University, recently received a grant award from the National Science Foundation to put PLTL into the lab. The Center for Authentic Science Practice in Education (CASPiE) project will use peer leaders to help students with discovery labs through the use of guided inquiry, as opposed to the traditional confirmation labs.

I think that projects such as this that contain the PLTL

model, which has proven to be an effective model for student success, coupled with discovery labs, will not only spark interest in the areas of math and science among non-majors and minorities, but also help them succeed in their education in science, math, technology, and engineering.

*Ingrid Leal
WPA/PLTL Project Coordinator
Chemistry Department
Northeastern Illinois University*

* Gafney, L. & Varma-Nelson, P. (2002). What happens next? A follow-up study of workshop leaders at St. Xavier University. *Progressions*, 3(2):1, 8-9.

WHAT WE'VE LEARNED; WHAT WE'RE STILL TRYING TO FIGURE OUT

(Continued from page 1)

tion was explained to students and those interested signed up for times that fit their schedules.

The results of participation during the Fall of 2000 correlated so dramatically with course grade (see Figure 1) that a departmental decision was made to have workshops be mandatory for all sections of introductory chemistry. Fall semesters 2001-2005 have had, on average, 30 leaders guiding 40 workshops which serve a total of 350 students enrolled in six sections of general or allied health chemistry, each taught by a different instructor. Workshops are also part of the sections of these courses that are taught in spring and summer semesters.

Scheduling: What We've Learned

Several suggestions are made here that may help others implementing PLTL for the first time.

1. If the workshop is an integral part of the course, with participation being mandatory, the workshop times need to be scheduled enough in advance that students can sign up for a workshop at the same time that they register for classes. If the registration procedure can be programmed so that enrollment in the chemistry course is not permitted without also registering for a workshop, so much the better.

2. If at all possible, workshops should be instructor-specific. After trying to have any student register for any workshop that went with that course, we decided it was much better for all students in a given workshop to be in the same section of the course so that all are on the same page and have received in class the same emphasis on the same material.

3. Speaking of being on the same page, try to schedule workshops together as far as the class schedule is concerned. For example, if a class meets on Tuesday and Thursday, all workshops for students in that class might be scheduled after the Thursday class and before the next Tuesday class. With this arrangement, it also helps if all the class tests can take place on Tuesdays.

Scheduling: What We're Still Trying to Figure Out

The main problems here are:

1. Keeping students from signing up for the wrong instructor's workshop. Despite notations in the online bulletin of courses and memos to advisors, this requires some sorting out at the beginning of each semester.

2. Finding times for weekly leaders' meetings such that all leaders working with a particular instructor can meet together and have that instructor also meet with them.

Recruiting: What We've Learned

During the early years of the workshop program it was a matter of beating the bushes to get a sufficient number of leaders, even though it was a paid position. Almost any student who would agree to serve was accepted. A corner was turned in 2004 when about twice as many applications were received as there were positions to fill. We believe this was in large part due to

word of mouth getting back from veteran leaders who had interviewed at medical and graduate schools and reported that "all they wanted to talk about was my workshop leader experience." We now know to:

1. Recruit first among current leaders. Once a PLTL program is established at least half the leaders should be veterans.

2. Identify potential new leaders via recommendations from instructors and from current leaders and encourage them to apply. A letter inviting them to become leaders should be considered "a mark of accomplishment and merit" (Gosser et al., 2001, p. 35).

3. Get quotes from current and recent past leaders and put posters containing these quotes all over the department (see Figure 2, p. 14).

4. Have instructors not only recommend but recruit. Sometimes a student demurring about applying will do so when a particular instructor – maybe one for whom that student is doing a research project – says, "I want you to lead one of the workshops for my general chemistry section next semester."

5. For fall workshops, the deadline for receipt of new leader applications should be at least one month before the end of spring semester. For spring workshops, the deadline should be at one month before the end of fall semester. This allows enough time to set up interviews and reach decisions.

Recruiting: What We're Still Trying to Figure Out

1. Some leaders and potential leaders have been involved in undergraduate research projects with faculty members who do not teach general chemistry. These faculty members have sometimes felt that the time students spent preparing for and leading workshops was detracting from efforts students should have been putting on research. Occasionally faculty members

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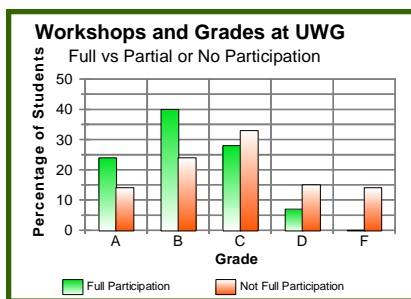


Figure 1. As seen on the graph, of all the students who participated fully in workshops, 24% earned an A and 0.4% failed. Of remaining students, 14% earned A and 14% failed.

who teach upper-level courses feel some of their students are neglecting their course work in favor of workshops. Careful selection of leaders is necessary, along with careful assignment of workshop times.

2. We're still trying to figure out how to tell which applicants are really going to make good leaders. Interviews, recommendations, and academic histories help us make good choices about 90% of the time. But occasionally a leader will be a disappointment.

Grading and Recordkeeping: What We've Learned

If the workshop is for a part of a student's grade in a course, it will probably be necessary to have a numerical workshop average for each student. We learned to:

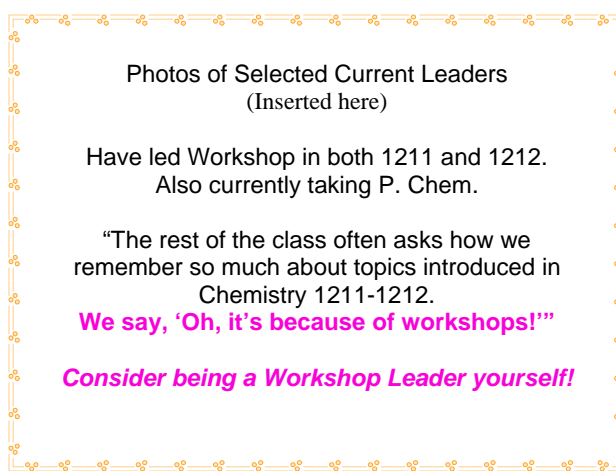


Figure 2. Sample recruitment poster with quotes

1. Decide what aspects of workshop will count for how much. After meeting and discussing this with leaders from other institutions, our leaders recommended a ten-point scale, with three points for attendance, three points for preparation (doing "homework" or self-test problems), three points for participation and attitude, and one point for finishing a summary quiz at the end of each workshop.

2. Have a standard report form for leaders. This has worked well on carbonless paper, so the leader can keep a copy while giving the original to the workshop coordinator.

3. Standards of scoring should be set high enough to avoid grade inflation.

4. To keep scoring standards consistent from leader to leader, we found it very useful to include practice on this as part of leader training. Tapes of workshops in progress were shown and leaders discussed how the participation points of various students should be rated until consensus was reached.

5. The "preparation" points are now based on online homework rather than on printed pre-workshop problems. Scores are downloaded by the workshop coordinator, so the individ-

ual leaders no longer have to assess whether or not a student has done sufficient homework to be prepared for workshop.

Grading and Recordkeeping: What We're Still Trying to Figure Out

A minor point is that not all leaders are always prompt about getting in their reports. At the end of each week there are usually one or two leaders who must be sent e-mail reminders to turn them in.

Also, while the training (point 4 above) helped, there still seem to be some differences from leader to leader in assigning marks to students. So far, there has not been a case where the workshop coordinator has had to step in at the end of the semester because the slight discrepancies would make a difference in a student's letter grade in the course.

Funding: What We've Learned

It would be nice to have an endowment that would keep the PLTL program functioning in perpetuity. Lacking that, however, we have had to look to our own resources once the grant ran out.

1. The biggest help in funding workshops is that we generate workbooks in-house.

Students purchase the workbooks via the same mechanism used for notes packets and other instructor-prepared materials that students are expected to purchase. Proceeds are used to pay leaders.

2. Having new leaders given course credit (in our case 2 semester hours) for their work means that they are paid only for the time actually spent in workshop. Training, preparation time each week, and attendance at leaders' meetings are part of the course requirements. Veteran leaders are somewhat more expensive, as they are allowed to count preparation time and time in leaders' meetings as "billable hours."

3. Sometimes extra-departmental funds are available on campus. The institution's foundation, or donation-raising arm, often makes small grants to departments for special projects. If the workshop program becomes a "showpiece," the president or vice-president may be willing to help support it from their discretionary funds.

Funding: What We're Still Trying to Figure Out

Money question are never easy and never entirely solved. Right now we are under pressure to save money by cutting back the number of workshops and increasing the

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WHEN THE MONEY DRIES UP: WHAT'S A DEAN TO DO? HOW YOU CAN HELP YOUR DEAN HELP YOU

(Continued from page 1)

end! We'll just apply for an extension.”

- Anger: “How do you expect me to pay for this?”
- Bargaining: “If I do this, will you...?”
- Acceptance: “Well, of course we have PLTL. Doesn't everybody?”

The ultimate goal is institutionalization, that is, we want to bind Peer Led Team Learning so into the culture of the University that it becomes the norm, and its model of teaching is seen as business as usual.

What does PLTL mean to a Dean?

From a Dean's perspective, the value of PLTL is directly related to its success in meeting mission-related institutional goals. That is, after all, how our university is judged by accrediting bodies and legislators: Do we do what we say we are doing? The following will help you help me help you ensure the long term success of PLTL at our university.

- *How does PLTL express the mission of the University and the College?*

For example, at NEIU, our mission is access and excellence. We provide a high quality education to the most diverse student body in the Midwest. So, you tell me about how PLTL uses cooperative learning as well as the more social and verbal learning styles that characterize many female and diverse learners. This means that we have more female and ethnic minority students who are successful in College level math and science and who become majors and later professionals in disciplines that are not usually seen as friendly to them.

- *Give me the data!*

Too often assessment data goes to the NSF or some other outside agency and I never see it. But I am the one who needs to know, for example, that you have improved retention and graduation rates among students of color, and I am the one who will have to defend the program to University Budget Committees, Provosts, and

even Trustees.

- *Show me a plan.*

My budget may have been made up eight months ago, and you are telling me NOW that I need to provide \$5000 for student stipends? Talk to me a year before the funding ends. Show me where else there might be funds available. Is there money for tutors? Can you handle larger lectures with Peer Leaders in place? I need to be able to offset funds against each other, because it is very unlikely my budget will show an increase next year.

- *Show me academic transferability.*

I am impressed by your success in your discipline. Can I get the same improvement in graduation and retention rates in Math? Biology? More women who are successful in Computer Science?

- *Can I call this faculty development?*

I may have access to funds that are not part of my instructional budget. You know how this has rejuvenated your own teaching. Help me help others rediscover that same excitement.

- *Help me find “in kind” trade offs.*

While the net cost may be the same, the funds may come from different areas, or (from my perspective, even better) from someone else's budget. Can we give students course credit instead of stipends? Tuition waivers? Dedicate a scholarship fund? How can I adjust faculty workloads appropriately?

Finally, one should never assume that a lack of cash support means that I do not support this (or any other) innovative teaching method. I am, after all, a teacher and scholar first. I believe in education and I care about students and faculty. But you have to help me see how I can do it. Bring me to acceptance.

*Kate Forhan, Dean
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number of students per workshop. While six to eight students is considered ideal, we may have to learn to function with twelve or even more. (Might it work to divide a larger group into two smaller groups and let the leader float from one group to the other?)

There are many other things that have evolved as the program matured, such as how best to arrange and carry out new leader training, making sure instructors and leaders can interact with each other, keeping workshops on

track with lectures, generating workshop material, finding meeting space, scheduling workshops to complement testing schedules, and dealing with students (and sometimes leaders) who just didn't seem to take to workshops. A particular problem is doing the public relations work to keep the department as a whole “on board” as far as supporting the efforts involved in the program. Some problems have been essentially solved, some ameliorated, and others we're still working on.

Lucille B. Garmon

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.

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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.