The Workshop Project Newsletter

Volume 1, Issue 2

Winter 2000

PROGRESSIONS: PEER-LED TEAM LEARNING

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http://www.sci.ccny.cuny.edu/~chemwksp

FACULTY SPREADING AWARENESS OF WORKSHOP MODEL

The enthusiasm demonstrated by faculty who have adopted the Peer-Led Team Learning (PLTL) model is evident in their willingness to present the topic at conferences, workshops, faculty development seminars, poster sessions, and other venues. While faculty involved in the original grant, *Workshop Chemistry Project*, continue to disseminate the PLTL model, an increase in the number of presenters from newer affiliates points to their desire to increase awareness of the model.

Presentations in the past five years have most often been through venues associated with the discipline of Chemistry, but as other disciplines are being added (in conjunction with the National Science Foundation's National Dissemination grant) the model's robustness and growth have broadened the nature of presentations. Presentations invariably have included active participation by trained workshop leaders. As noted by Ellen Goldstein, Learning Specialist, City College of New York, one factor in "disseminating the idea of the PLTL model must involve the Peer Leaders, who distinguish the PLTL model from other cooperative or team learning models. As demonstrated at many presentations and conferences, the peer leaders are central to the program and their performance has become an integral part of the program."

"The PLTL model is great fun to talk about, because it's something that works. It's exciting because it makes partners of students and faculty," commented Pratibha Varma-Nelson, Professor of Chemistry, St.

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FIRST ROUND OF WPA GRANTS AWARDED

The Workshop Project Associate (WPA) grant program provides funds to faculty and learning specialists to assist in the development of a workshop course at their institution. To be eligible for a WPA grant, applicants must show evidence of familiarity with the Peer-Led Team Learning (PLTL) model of instruction. Knowledge about the model may be gained through attendance at short courses offered by project faculty and learning specialists in the Chautauqua Faculty Development Program, as well as other courses sponsored by the PLTL Project (check the website). Having a mentor from the project or spending a sabbatical at one of the parent institutions are other ways of gaining familiarity with the Workshop Model.

Applications were received from faculty in Biology and Chemistry by November 1, 1999. Biology applications were submitted to Michael Gaines of the University of Miami, and those in Chemistry went to Pratibha Varma-Nelson of Saint Xavier University in Chicago. Of the six applications received, one is being revised and will be re-submitted in the next round.

Reviewers paid close attention to the proposed plans for meeting the six Critical Components of the PLTL Model, as well as plans for dissemination and evaluation of the results. Leo Gafney, Project Evaluator, will

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PROJECT NOTES: THE TEAM IN PLTL

...life experience ... demands that we re-examine our preconceptions regarding teaching and learning from the social perspective.

The Peer-Led Team Learning Workshop Project is eclectic – the ideas and practice that can be useful in teaching are varied as life itself. For a method of teaching to be robust, it must recognize that learning takes place in many contexts. Too often, however, learning is examined only in the context of the individual interacting with a "teaching unit" such as an instructor, a textbook, or an interactive computer program. This one-dimensional view is contradicted by life experience, which demands that we re-examine our preconceptions regarding teaching and learning from the social perspective. To fail to do so is to fall into a procrustean fallacy - sacrificing the individual's potential to force-fit students *en masse* into an outdated mass production model.

This recognition of the paramount importance of the social perspective has had a major impact on private and public organizations that have been forced to re-examine traditional hierarchical relations in their quest to be "learning organizations," capable of interpreting data and complex relationships relevant to their missions. These ideas have percolated throughout much of the modern technological world, and key concepts of effective teamwork and distributed intelligence have emerged.

Jon R. Katzenbach and Douglas K. Smith's *The Wisdom of Teams* (HarperCollins, 1993) is the best reference that I know of to learn more about the nature, structure, and potential of teams, and should be recommended reading for anyone interested in PLTL. They offer the following definition: "A team is a small number of people with complementary skills who are committed to a common purpose, performance goals, and approach for which they hold themselves mutually accountable." Teams which show particularly high performance have "members who are deeply committed to one another's personal growth and success."

Katzenbach and Smith present several detailed case studies of actual teams, mostly from an industrial/technological perspective. Surprisingly, however, what I read in *The Wisdom of Teams* comes as close as I have seen to a description of much of what is at the heart of PLTL, and underlines from an unexpected source, why peer-led team learning is effective. From the perspective of our PLTL Project, the book can be read on two levels. The first is to explore the experiences and practices of teams, which can inform our PLTL courses and leader training. The second is to examine the organization and effectiveness of our dissemination efforts according to the criteria of a high performance team.

Some of my favorite quotes from *The Wisdom of Teams* relate to the role of the team leader, and appear on page 12. I hope you share them with your peer leaders.

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CORRECTION
The University of the Pacific was listed erroneously in the Fall 1999 issue as being in Portland, OR. The listing should read:

University of the Pacific
Dept. of Chemistry
Stockton, CA 95211
Contact: Donald Wedegaertner

DISSEMINATING PLTL ON MULTIMEDIA

Digital multimedia technology is being used to further the impact and access to the PLTL Workshop model. Actual peer-led workshops are recorded, demonstrating such techniques as *Concept Mapping, Round Robin,* and *Pair Problem Solving*. The clips provide visual and auditory examples of the application of these methods to solving problems. The video clips are then edited and copied onto a CD-ROM which can be viewed on computers (PC version).

Project staff, led by Robbie Gosine and Andrei Lalla, Project Assistants, have produced trial versions. A fully functional CD-ROM is expected to be ready in August 2000. Video clips from other campuses, and in disciplines besides Chemistry are being sought. Please contact project staff if you would like to provide video clips or suggestions for the CD-ROM project.

PLTL Workshop Project Coordination

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VYGOTSKY'S ZONE OF PROXIMAL DEVELOPMENT: A THEORY BASE FOR PEER-LED TEAM LEARNING

Imagine science without theory. We would have nothing but a slew of empirical data with no framework upon which to make sense of our observations. Some progress would be made toward understanding the universe and learning how to exert control over the natural world, but it certainly would not be as dynamic and efficient as with theory-driven science. In fact, it is probably not possible for the human mind to merely accept scientific data without attempting to theorize about the underlying causes of the phenomena.

Now consider teaching. Is teaching scientific in that it is theory driven or is it largely an empirical process? For many, teaching certainly is an empirical process. We begin our teaching careers by teaching as we were taught, with changes along the way as we experiment with various techniques.

What if teaching could be changed so that there is a theory base behind our actions, where theory and experiment mix together to form a science of teaching? Could this improve the quality of teaching? I, for one, believe the answer is yes. And I am not the only one who advocates a scientific approach to teaching, as there is a small but growing community of science educators who are attempting to develop curricula by following theory and theory-driven experiments.

Theories about how students learn should be curriculum drivers. Vygotsky's theories of education are a great place to start to gain an understanding of the theoretical underpinnings of Peer-Led Team Learning (PLTL).

Lev Vygotsky (1896-1934), born in Byelorussia, was a psychologist who lived during the Marxist era of the former Soviet Union. His works were not known in the West until the 1962 publication of his book *Thought and Language*. It is very interesting that Vygotsky was a critic of Piaget, given that Piaget's works have had the greatest influence of any psychologist over chemical educators. Nonetheless, both Vygotsky and Piaget were constructivists, and both theories can be used to understand student learning.

The most important concept from Vygotsky's works, as applied to PLTL, is the *zone of proximal development*, or ZPD. Vygotsky defined this concept as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers." The lower end of the ZPD is defined by what the student is capable of doing independently. This is what would be measured by a classic IQ test. The high end of the ZPD reflects what a student can do when given hints and guidance during the problem-solving process. With the ZPD concept, Vygotsky puts forth a new way of viewing intelligence. Instead of a static point, it is a range where the traditional view of intelligence defines the low end of the zone. Vygotsky believed that the width of a student's ZPD is a better predictor of potential for success in school than is traditional IQ.

Problems above the upper end of a student's ZPD cannot be solved, even with assistance. Problems at the lower end can be solved independently. Thus, problems within a student's ZPD are those more difficult than those that can be solved at a student's present level of development, but can be solved with tutoring. As a student learns to solve such problems, the lower end of their ZPD is redefined at a higher level, and the student grows. It is therefore imperative to work within a student's ZPD. This represents our overarching goal in the peer-led team learning model: peer leaders help students to work within their ZPD.

Classroom time in traditional curricular models rarely is used to challenge students to work in any fashion, let alone within her/his ZPD. Much of it is passive notetaking and listening to others solve problems. The PLTL model restructures this time so that some of it is spent in the optimal learning setting, as defined by Vygotsky. It is important to note that Vygotsky specifically stated that "more capable peers," or workshop leaders in the PLTL model, can be used to promote learning within the ZPD.

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IS LEADERSHIP TRAINING ESSENTIAL?

...Without leader training, workshop leaders tend to default to what they know best - recitation.

Leader development is not a natural, intuitive process: it has to be disseminated as an integral part of the Peer-Led Team Learning model.

The Workshop Project's summative evaluation has identified *leader training* as one of the PLTL model's Critical Components, but in a 1996 survey*, when leaders were asked if they were taught theories of learning and related methods of teaching, about 50% of the leaders responded "no" or "little." Leaders were also asked if training was helpful, and 69% of the workshop leaders strongly agreed that it was and only 5% disagreed. This study also found that without leader training, workshop leaders tend to default to what they know best - recitation.

Some of us who have trained leaders over the years have identified several of the critical components for effective leader training. It starts with the selection process. Vicki Roth and Jack Kampmeier, the University of Rochester, developed a protocol for the selection of leaders, which was adopted at the City College of New York (CCNY). The first step is a *recruitment event*, held late in a semester/term, where students apply for the position. They are then *interviewed*, undergoing a similar selection process as when applying for a job. Once the leaders accept the position they must *commit, on a weekly basis*, to leading a *two-hour workshop session*, and participating in *leader training meetings* that deal with content, pedagogical practice, and issues of group leadership (which, at some institutions, is a *training course)*. At CCNY, students requested an introductory seminar before the semester begins, which is the beginning of a one-hour, one-credit course. We have found that a two-day seminar allows students to reach a certain comfort level to begin as a leader.

The leader training meetings, (or training course) continue throughout the semester and include the following elements:

- group dynamics (e.g., cooperative learning)
- pedagogical tools (e.g., ice breakers, concept maps)
- basic learning theories (e.g., learning styles)
- equity issues (e.g., gender, race and ethnicity issues, as well as access to multimedia)
- developmental theories (e.g., Vygotsky, Perry)
- skill and leadership development (e.g., reflective writing and exercises)
- assessment (informal and summative)

Leader development is not a natural, intuitive process: it has to be disseminated as an integral part of the Peer-led Team Learning model. As John Goodwin from Coastal Carolina University stated in our first newsletter (Fall 1999), "I think that as we adopt the critical components and train our leaders better, the program is working better."

Yet not all colleges can provide a learning specialist. Here at CCNY we are piloting a distance learning course with one of the WPA grant recipients, Dr. Pamela Brown from New York City Technical College. Her two leaders participated in our two day seminar at CCNY, which provided the personal contact between workshop leaders at CCNY and New York City Tech, and supplied some basic training, including an introduction to the on-line course.

We are using the *Blackboard!®* course information system, a template-driven application that allows a dynamic and interactive course web site to be set up by faculty without significant technical support and is relatively easy to use for novices to the Internet.

Making leader training an integral part of the PLTL Workshop model at all campuses strengthens not only the effectiveness of the peer leaders in facilitating team work, but gains them the opportunity to view learning and teaching in a more global and more strategic sense.

To strengthen leader training there is further need to assess the components of format, course content and practice. To do this effectively an ongoing forum must be established where discussions focus on leader training and practice. The conference on *Training Peer Leaders* at the University of Rochester from June 18-20, 2000 affords the opportunity for the beginning of such a discussion. Other means of communication and dissemination of ideas on effective peer-leader training must also be developed and implemented.

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* Gafney, Leo. "Workshop Chemistry Evaluation" (Chapter 6), in *The Workshop Project: Peer-led Team Learning— A Guidebook (in press).*

EVALUATION STRATEGIES

Over the past five years (1995-2000) there have been three stages in the overall evaluation of peer-led workshops.

1. *Implementation* Initially, project leadership was interested in everything that was happening and looked at all activities, procedures, responsibilities, etc. connected with the program. We knew that cooperative learning had proven value and that peer leaders could be highly effective, but much was still unknown about the details that would be needed for a successful PLTL program. We gathered data through focus groups; surveys of students, student leaders, and faculty; interviews with participants at all levels; observations; use of literature from related programs; and comparative studies.

2. *Outcomes* Evaluation activities and the analysis of data by the Project Evaluator, by individual professors conducting comparative studies, by learning specialists, and others provided a set of outcomes clearly indicating the success of the workshops. A few of these outcomes are:

... Students in the workshop groups almost always achieve better grades than similar students taking the same course, tests, etc. but not participating in workshops;

... Students value the problem solving skills, group interactions, and conceptual development that peer led team learning provide them;

... Peer leaders demonstrate growth in their ability to work with groups and individuals, and acquire deeper levels of understanding of the discipline in which they work.

3. *Critical Components* A consideration of the outcomes led to the articulation of the six critical components now familiar to those adopting the PLTL model. These components provide a basic plan for introducing PLTL learning, and also for evaluating a program once it has been implemented.

<u>Critical Components and Evaluation</u>

There is solid evidence that the PLTL workshop model leads to success, but when certain elements are not present the workshop will not proceed as designed, problems generally occur, and student performance is less likely to improve. While the Project Evaluator will continue to gather and analyze data, it is important that, as the PLTL model is more widely adopted, faculty members participate in its evaluation. The more data we have from a variety of settings and disciplines, the more able we will be to account for the success of PLTL and to address problems.

1. *Integration of Workshops With the Total Course* This is to some extent an umbrella category bringing together the other components. But it needs to be stated if only to maintain vigilance against the possibility of sliding toward a TA/recitation arrangement. Also, we have noticed an important morale factor. Students report positively about the workshops when they experience that the workshops improve their overall learning and contribute to success.

... The workshops take a considerable amount of student time and energy. Consequently students must value the workshops or the impact will be considerably diminished.

... Second, integration means that the workshop leaders are aware of the approach taken in the lectures and the professor's overall method.

... Third, the model requires that the professor refer to the workshops in lectures and at other times indicating their importance to learning.

Although the workshop program can be coordinated by a faculty member or graduate student not teaching the course, it has been found that this can lead to a lack of overall fit. Student leaders are one step removed from the lecturer; students in workshops are two steps removed. When questions arise, there is a lack of confidence by both students and student leaders that the priorities and methods of the instructor are clearly understood and are being interpreted correctly in the workshops.

2. *Involvement of Workshop Professors:* Professors adopting the Workshop model are involved at differing levels concerning the supervision of leaders; attendance at the workshops themselves; and the development of materials.

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EVALUATION STRATEGIES: CRITICAL COMPONENTS

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Guidelines for the most appropriate levels exist in different parts of program documents but have not yet been organized, and there are a number of open questions. The workshop model recommends that the professor:

... preview the workshop materials and activities with the student leaders;

... prepare, review, and update the workshop materials; and

... be available to students and student leaders according to need.

3. *Training and Activity of Workshop Leaders* The training of leaders varies from site to site depending on the interest of the workshop professor, the presence of someone trained in science or math education, the involvement of a learning specialist. We hope that on-going analysis will reveal more about the behaviors and procedures needed for training leaders and for identifying successful approaches by the peer leaders. The model recommends:

... that workshop leaders be skilled in group work,

... that they perform as facilitators rather than lecturers or teaching assistants,

... that they have a training program before they begin, and

... that they have content knowledge and problem-solving ability appropriate to undergraduate students.

The presence and activity of the peer leader distinguishes the PLTL Workshop model from most other varieties of cooperative learning. Peer leaders generally understand that they are to guide rather than give direct instruction. But there is considerable variation in the style of problem solving that peer leaders adopt. Some are more algorithmic, showing students how to set up and solve particular problems. Others are more conceptual, stressing the general principles and abilities that will permit students to approach categories of problems.

4. *Materials.* In general, professors adopting the workshop approach spend considerable time writing or adapting materials. The model recommends:

... that materials be challenging and engaging but not so difficult as to discourage students;

... that the skills and knowledge developed in workshops be directly related to tests and grades; and

... that the materials lend themselves to small group work.

Interviews with workshop professors reveal a general appreciation of materials made available, combined with a need to adapt them to local situations. The same materials have been reported to be too difficult at one site and too easy at another. It is expected that the chemistry materials prepared, piloted, and published by the *Workshop Project* will be useful at a number of sites and that the process may provide a model for other disciplines. Physics, biology and mathematics are beginning to develop packages of materials suitable for PLTL.

5 *Organizational Arrangements.* There are a number of important workshop arrangements, particularly space, time, and the size of groups. The Workshop model recommends:

... a two hour workshop, held once a week,

... about 6-8 students per group,

... that attendance be required, and

... that space be adequate for concentrated small-group activities.

Preliminary data indicate that there is a correlation between the length of the workshop and the proportion of time spent on interactive group activities. Surveys of *Adopt and Adapt* sites reveal that in shorter workshops the peer leader spends proportionately more time answering students' questions than in the longer workshops in which proportionately more time is devoted to small group learning.

In a similar way, when the size of the group increases, the session tends to evolve into a number of smaller groups, of three to five students, with the peer leader visiting each group in turn. It has also happened on occasion that through attrition or dissatisfaction the group's size may degenerate into a group of two or three students. Thus it becomes clear that the critical components are organically linked to one another.

6. *Departmental and Institutional Support* This is critical for institutionalization. The workshop program cannot survive without adequate resources, nor is it likely to survive if implemented by one or a very small number of faculty. A critical mass is required for the workshop approach to take root and become a normal part of the business of a department and institution. The model suggests that:

... the workshop approach be extended across several courses and disciplines;

... that administrators such as department heads and deans support the workshop approach; and

... that the institution provide local funding.

Interviews with workshop faculty have uncovered a pattern regarding institutional support. At the outset, when first planning workshops, faculty members are generally enthusiastic about the pedagogical advantages, have acquired some resources with which to pay peer leaders and have begun to develop materials. Consequently they are not much concerned with institutional support. But after a few years, particularly if colleagues begin to adopt workshops, the

Critical Components			
1. Integrated with the Course	Students view workshop as important to learning	Leaders are aware of lecture approach	Lecturer refers to workshops
2. Professor's Involvement	Preview of problems with peer leaders	Preparation and review of materials	Available to students and student leaders
3. Leaders	Skilled with groups; facilitator rather than teacher	Training and supervision	Discipline knowledge and problem-solving skills
4. Materials	Fit with course; relate to tests	Engaging and appropriately	Suitable for group activity
5. Organizational Arrangements	Time	Space	Group size Attendance
6. Evidence of Support and Growth	Disciplines and courses	Support	Support

Table I - Critical Component Evaluation Matrix for PLTL. This table summarizes the essentials for each critical component. It is useful only in connection with the explanatory materials. Group size, for example, refers to the accepted norm, based on considerable experience, that peer led team learning will work effectively with groups of about 6 to 8 students.

need for on-site support becomes evident and even critical for long-term success.

The table (above) summarizes the workshop model and the ratings associated with the recommended approach. The table may give the impression of an overly mechanical approach. But it is simply an attempt to list the various elements that have been found important in the workshop model.

Student Performance Since the first sites in the project began workshops more than five years ago, a number of comparison studies have been made to gather data about the effectiveness of the workshops on student performance as reflected in tests and grades. To date there are eight studies that have achieved strong positive results, and one study with ambiguous results. Several other studies are currently underway.

As workshop methods are adapted it will be important to add to the collection of studies, especially to determine how the workshops flourish in differing environments and disciplines. Professors can also contribute additional data by maintaining records of attendance, grades, and in so far as possible, tracking the academic decisions and careers of peer leaders.

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FIRST ROUND OF WPA GRANTS AWARDED

(Continued from page 1)

assist the new Workshop Project Associates in evaluating their implementation of the PLTL model.

Valuable data are expected to be gathered in the areas of student performance, peer leader training, and suitability of materials. It is also expected that new materials in Chemistry, Biology, and Physics will be developed by some Associates.

The Fall 1999 Workshop Project Associate grants were awarded to:

Mr. Jim Bridger
Prince George's Community College
Term of Contract: June 1, 2000 - December 1, 2000
Discipline: Biology
Awarded: $5,000 Matched: $1,350
Peer Leaders: 6 Students: 48 (groups of 7)

Dr. Pamela Brown
New York City Technical College, Chemical Technology Program
Term of Contract: August 1, 2000 - December 1, 2000
Discipline: Chemistry
Awarded: $5,000 Matched: $5,000
Peer Leaders: 5 Students: 30-48 (groups of 6-8)

Dr. John F. Cannon
Brigham Young University
Term of Contract: January 1, 2000 - June 1, 2000
Discipline: Chemistry
Awarded: $5,540 Matched: $27,602
Peer Leaders: 30 Students: 1500 (groups up to 13)

Dr. David Garin
University of Missouri-St. Louis
Term of Contract: January 1, 2000 - June 1, 2000
Discipline: Chemistry
Awarded: $5,000
Matched: Department has provided funds for three undergraduate peer instructors in Fall of 1999, and a new position of workshop instructor for an organic chemistry course. Salaries: Two graduate student-leaders in each in summer and fall semesters.
Peer Leaders: 8 Students: 170
Undergraduate leader to have 8 students per group.

Dr. Thomas D. Getman
Northern Michigan University
Term of Contract: February 15, 2000 - June 1, 2001
Discipline: Chemistry
Awarded: $4,456 Matched: $3,956
Peer Leaders: 6 - Fall, 2000 (group size of 9)
6 - Spring, 2001 (group size of 9)

FACULTY PRESENTATIONS: BUILDING AWARENESS

(Continued from page 1)

Xavier University.

"Chemistry is an exciting subject, and I want the students to experience the excitement that comes from understanding it. Students have to interact with the material and each other to understand concepts. The Workshop model provides a mechanism for this to happen. This is why I want to share my experience with the PLTL model of teaching with others.

"It has been gratifying for me to be part of the development phase of this model and now I am enjoying disseminating it," she said.

Jack Kampmeier, Professor of Organic Chemistry, University of Rochester, agrees completely. "Peer-led team learning is a major change in helping students to learn Organic Chemistry.

"Organic Chemistry is legendary on every campus as being an impossible course, the most difficult course, a weed-out course. Yet it is the most beautiful subject, it has intellectual coherence, it's an incredibly powerful way to think how the world works, how to understand and manipulate it.

"There is a contradiction between the public myth and the way I think of the field. PLTL is a new way to make the beauty and the power of Organic Chemistry available to students.

"In chemical terms, peer-led team learning is a means to lowering the activation energy barrier; we're trying to be catalysts, to help other faculty and students get started."

Madeline Adamczeski, Professor of Chemistry, San Jose City College, when asked why a faculty member from a new affiliate would become so active in speaking about PLTL, responded immediately.

"For the students, of course! My most fulfilling impetus is to see my workshop leaders succeed and be recognized. The successes of the peer leaders serve as inspiration to future leaders, their students in their workshops. I also believe that those students who aspire to be future workshop leaders take the course more seriously than they ordinarily would.

"My passion about the Project stems from the fact that the results have surpassed my expectations. Yet many of the positive results have not yet been recognized. One such aspect is the ability of the instructor to write more in-depth letters of recommendation. The letters include the obvious instructor-student relationship but also the mentor-advisee relationship. This latter relationship permits the instructor to elaborate on a unique rapport, not dissimilar to that of an employee-employer. A brief description of the Project, the role the student played and a description of how peer-leader responsibilities were met can be included. And so aside from the invaluable paid work experience that the peer leaders obtain, other rewards are possible and can include co-authorship, presenter at a scientific conference, and/or an in-depth letter of recommendation.

"What drives me to travel around the countryside is my passion to assist students to obtain their goals---not very different from my fellow academicians. What makes my cause perhaps more passionate is that I secretly wish that my own education had offered such a program.

"In my five years' experience with the Project at two different institutions, my participation is one of the most fulfilling and rewarding aspects of my position. Why not share such positive experiences? My hope is that a continuous wave of evidence of positive outcomes will provide the impetus for prospective Workshop Project Associates to join the Project."

David Gosser, Professor of Chemistry, CCNY, considers another dimension. "Why go "on the road" for PLTL? Of course there are many reasons, among them the enjoyment of working with peer-leaders. I think there is another important driving force. By participating in conferences and other meetings we all get a chance to meet some very generous and thoughtful individuals, many with a lifetime of experience in science and teaching. They often become very involved in the Project and bring new talents and insights into the mix. In fact this is the primary mechanism for the growth of the leadership of the project."

"In chemical terms, peer-led team learning is a means to lowering the activation energy barrier; we're trying to be catalysts, to help other faculty and students get started."

"I believe my passion about the Project stems from the fact that the results have surpassed my expectations."

"I also believe that those students who aspire to be the future workshop leaders take the course more seriously than they ordinarily would."

SYMPOSIA ON PLTL FEATURED AT BCCE

Peer-led team learning will be featured during two symposia as part of the 16th Biennial Conference on Chemical Education (BCCE). The Conference will be held July 30 to August 3, 2000 at the University of Michigan, Ann Arbor, Michigan. The symposia were organized by Pratibha Varma-Nelson, who will make introductory and concluding remarks for both sessions, which run from 2-5 PM, on Monday, July 31, and Wednesday, August 2. Topics and speakers are listed below, and more information on the conference can be found at http://www.umich.edu/~bcce.

Monday, July 31

Student-Assisted Teaching and Learning: Models, Strategies & Outcomes,
Marilyn Miller, University of Missouri-Columbia

CHEM-2-CHEM Tutoring: Proof of Performance
Rosita Báez and Héctor Colón, Cayey University College

Evaluation of Peer-Led Team Learning
Leo Gafney, Independent Evaluator

Peer-Led Chemistry Workshops at Portland State University
Gwen Shusterman and Carl Wamser, Portland State University

Peer-Led Team Learning at a Large State University. A Case Study
Joseph Wilson, University of Kentucky

Changing the Mode of Instruction Means Changing the Mode of Assessment
Thomas Greenbowe, Iowa State University

Structured Study Groups Empower Student Learning
Brian Coppola, University of Michigan

Wednesday, August 2

PLTL: The Kinesthetic Dimension
David Gosser, City College of New York

Analysis of Peer-Led Team Learning from a Social Constructivist Perspective
Jeffrey Trautmann and Mark Cracolice, The University of Montana

Learning Styles as an Influence on Training - an Essential Component of the PLTL Model
Ellen Goldstein and A. E Dreyfuss, City College of New York

Experimenting With Team-Learning Workshops Using Both Undergraduate and Graduate Students as Workshop Leaders
David Garin, University of Missouri-St. Louis

Peer Mentoring in a Large Chemistry Laboratory Course
Michael F. Golde, University of Pittsburgh

Adapting and Adopting the Peer-Led Team Learning Model
Jack A. Kampmeier, University of Rochester

APPLYING FOR WPA GRANTS

In order to disseminate the Workshop Model for Peer-Led Team Learning, the Workshop Project Associate (WPA) program provides funds to assist faculty and learning specialists in developing and implementing a workshop course at their institution.

Eligibility: Proposals may be submitted for support of Peer-Led Team Learning course development in any field of science and in mathematics.

Proposals are invited from academic institutions in the United States and its territories. Applicants must show evidence of familiarity with the PLTL model of instruction. This can be demonstrated through attendance at a short course or workshop (e.g., see information about Chautauqua short courses on page 9). Evidence of a mentoring relationship with an experienced PLTL instructor is desirable.

Future deadlines will occur two times per year through academic year 2001-2002.

For further information on deadlines and application details, please visit the PLTL Workshop Project site at http://www.sci.ccny.cuny.edu/~chemwksp.

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CHAUTAUQUA COURSES ON PLTL

Peer-led workshops are an effective way to engage large numbers of students with course material and each other. Improved performance and retention, development of communication and team skills, higher motivation and course satisfaction, and increased interest in pursuing further study in science and mathematics are among the benefits of the Workshop approach.

WEST COAST: MAY 18-20, 2000— PASADENA, CA

Presenters: Pratibha Varma-Nelson (St. Xavier Univ.), Jack Kampmeier (Univ. of Rochester), Mark Cracolice (Univ. of Montana), Ronald Narode (Portland State Univ.), and experienced peer-leaders

EAST COAST: JUNE 15-17, 2000— PHILADELPHIA PA

Presenters: Pratibha Varma-Nelson (St. Xavier Univ.), Jack Kampmeier (Univ. of Rochester), David Gosser (CCNY), Victor Strozak (Grad. Ctr., CUNY), and experienced peer-leaders

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For more information on the courses, contact Pratibha Varma-Nelson, varmanelson@sxu.edu.

AN PPLICATION OF LEARNING THEORIES

Editor's Note: Nardia McFarlane is a student leader at City College of New York. Here, she explains how she applied the Kolb Learning Styles model and McCarthy's 4MAT system to help the students in her group understand a chemistry concept.

Learning is the process by which we take in information, process it, and incorporate it in our everyday lives. A learning style is our preferred way of perceiving and processing this information.

The Kolb Learning Style Model[1], otherwise called the Experiential Learning Model, was developed by Dr. David Kolb in 1971. It is primarily based on two principles set forth by the Experiential Learning Theory:

1) People learn from immediate, here-and-now experience, as well as from concepts and books.
2) People learn differently, according to their preferred learning style.

<u>Description of the Kolb Model</u>

The model is divided into four different dimensions, two perceptive and two processing. The perceptive dimensions are:

1) Concrete Experience - learners perceive by direct contact with the physical aspects of the world; they rely heavily on their senses (Sensors/Feelers).

2) Abstract Conceptualization - learners perceive by analysis and observation; they rely on their intuition (Thinkers).

The processing dimensions are:

3) Active Experimentation - learners process by actively working with new information; they require hands-on experience (Doers).

4) Reflective Observation - learners process by thinking about what they're observing (Watchers).

When the four dimensions are drawn on a circle,

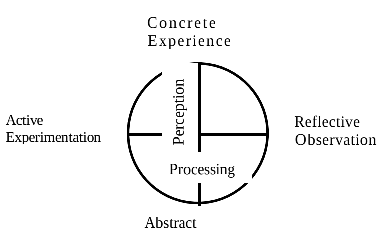

Fig. 1

divided by two axes— vertical (perception) and horizontal (processing), four quadrants are set up. (See Fig. 1) Different individuals fall in different quadrants and toward varying extremes. Research and clinical observation in the quadrants have shown that there are four basic learning styles, corresponding to the four quadrants. Each learning style has its characteristic mode of perceiving and processing information.

? Type 1 learner (Diverger)- perceives by concrete experiences and processes by reflective observation.

? Type 2 learner (Assimilator)- perceives by abstract conceptualization and processes by reflective observation.

? Type 3 learner (Converger)- perceives by abstract conceptualization and processes by active experimentation.

? Type 4 learner (Accomodator)- perceives by concrete experience and processes by active experimentation.

<u>The 4MAT System</u>[2] was developed by Bernice McCarthy, an educator aware of the learning differences among students. She used the Kolb Learning Style Model to further define the four different learning styles and did research on

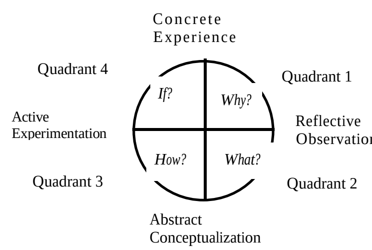

Fig. 2

the functioning of the brain with respect to them. From her research she discovered that there are specific questions that each learning style is prone to ask: *Why, What, How and If.* (See Fig. 2)

<u>The Eight-Step System</u>

McCarthy's system serves as a method of targeting each question, and learning style, through a series of eight steps:

1) (In quadrant 1: *why)* Create a question or circumstance.
2) Ask the students to analyze it.
3) (In quadrant 2: *what*) Incorporate the analysis into the concepts.
4) Develop the concepts and ideas further.
5) (In quadrant 3: *how*) Make practical applications of the concepts.
6) Begin working out the possible solutions according to the concepts applied.
7) (In quadrant 4: *if*) Analyze the application paying special attention to its relevance and accuracy.
8) Work out the full answer and apply these concepts and methods to more complex situations.

PROBLEM-SOLVING THROUGH LEARNING STYLES

Application of the Eight-step System
to a Chemistry Problem

Quadrant 1: **Why?**

1) Give the problem: Use the solubility rules to predict whether or not a precipitation reaction will occur when the following aqueous solutions are mixed. Write the molecular and net ionic equation for the reaction.[3]

A: *Iron (III) sulfate + sodium hydroxide*

2) Ask the students to analyze it: Why this problem, what will occur in the solution?

A: *The ions in solution will exchange their partners: metathesis reaction.*

Quadrant 2: **What?**

3) Ask the students to incorporate the analysis with the concepts. What determines whether or not the product of the metathesis reaction will be a precipitate?

A: *The solubility rules predict whether the products are soluble (in this case no precipitate will form), or insoluble, (in this case there will be a precipitate).*

4) Have the students further develop their ideas and the concepts.

A: *The products of the metathesis reaction are sodium sulfate and iron (III) hydroxide. According to the solubility rules, all sulfates are soluble except for* Ca^{2+}, Sr^{2+}, Ba^{2+}, Ag^{+}, *and* Pb^{2+}. *Also according to the rules all hydroxides are insoluble except for* Ba^{2+}, Li^{+}, Na^{+}, K^{+}, NH_4^{+}.

Quadrant 3: **How?**

5) Apply the concepts and ideas to the problem.

A: *Sodium sulfate is soluble, and therefore not a precipitate.*

Iron (III) hydroxide is insoluble and is therefore a precipitate.

6) *Ionic equation:* ?

$Fe^{3+}(aq) + SO_4^{2-}(aq) + Na^{+}(aq) + OH^{-}(aq)$? ?? $Fe(OH)_3\,(s) + Na^{+}(aq) + SO_4^{2-}\,(aq)$

Net ionic equation: $Fe^{3+}(aq) + OH^{-}(aq)$? $Fe(OH)_3(s)$

Molecular equation: $Fe_2(SO_4)_3(s) + NaOH(aq)$? ?? $Fe(OH)_3(s) + Na_2SO_4(aq)$

Quadrant 4: **If?**

7) Analyze the application paying attention to relevance and accuracy.

Net ionic equation is correct and balanced. The molecular equation is correct; however it needs to be balanced.

Balanced net ionic equation: $Fe^{3+}(aq) + OH^{-}(aq)$? $Fe(OH)_3(s)$

Balanced molecular equation: $Fe_2(SO_4)_3\,(aq) + 6NaOH\,(aq)$? $2Fe(OH)_3(s) + 3Na_2\,SO_4(aq)$

8) Leave out the final correct answer, and ask students to apply the same procedure to another problem.

mercury (I) nitrate + sodium bromide ? ?(I)

Note of Interest

Kolb's Model has been applied to other science fields outside of Chemistry. For example, in a Physics workshop conducted during Summer 1997 at Texas A &M University[4], the model was used to teach Heat Transfer to a group of students. The response of the students to this teaching method was very positive. They said the model helped them to see the relationships involved and gave them a better understanding of the topic.

Conclusion

Finally, in order to promote an equal opportunity for growth and success in any field, educators need to realize that not all students learn the same way. They each come with their preferred learning style in the hope that it will help them achieve success. Different aspects of a course require the use of different learning styles, and because students are sometimes unable to make the transitions when necessary. It is left to the teacher to try and accommodate individual students. Trying to target each learning style is not an easy task to accomplish; however, research has shown that teaching through learning styles can increase the level of achievement among students in any course.

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[4] http://sophcoal.tamu.edu/fall97/summerwkshp/kolbcycle/tsld010.html

Debut of New Logo

Created by Robb Gosine
Please contact PLTL staff to obtain the template.

Progressions: Peer-Led Team Learning is a quarterly publication of the Workshop Project.

Progressions is intended to build the Workshop community by telling the stories of adoption of the Workshop Model at institutions of learning. It also will provide useful examples of materials that have been successful, and is intended to be a forum for what works in leader training.

The editors are looking for contributions: please contact us with special concerns you would like addressed, have a presentation or workshop to announce, or an article that you believe others would find interesting.

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This newsletter, and the PLTL Workshop Project, 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.

On Team Leaders

(Continued from page 2)

Team Leaders do not believe they have all the answers, so they do not insist on providing them.

He or she must give up decision space only when and as much as the group is ready to use. … this is the essence of the leader's job, striking the right balance between providing guidance and giving up control.

As the potential team grows into a real team, and possibly a high performance team, the leader's job changes markedly. His or her formal authority may go unchanged, but when, whether, or how to use it shifts.

In one sense, the team leader is the ultimate utility infielder or substitute player; he or she must be there to deliver only as needed.

Most good team leaders need to learn a lot after they've been selected.

Team leaders act to clarify purpose and goals, build commitment and self confidence, strengthen the team's collective skills and approach… and create opportunities for others.

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