The Workshop Project Newsletter

Volume 3, Issue 3 & 4

Spring & Summer 2002

PROGRESSIONS: PEER-LED TEAM LEARNING

INSIDE THIS ISSUE:

website:
www.pltl.org

HOW ARE WE DOING? STEADY GROWTH IN IMPLEMENTING PEER-LED TEAM LEARNING

When the Peer-Led Team Learning (PLTL) National Dissemination Project was funded in the Fall of 1999, it built on the success of the Workshop Chemistry Project (1995-2000). Growth in implementing PLTL has also benefited from seed funding through Workshop Project Associate (WPA) grant awards that have promoted the spread from chemistry to other science disciplines and mathematics. In addition, through various outreach efforts, some faculty have adopted PLTL workshops without receiving funding from the National Dissemination Project.

The key person to adopt peer-led workshops in a course is a faculty member, so each one to do so is defined as an "Affiliate." A list of Affiliates was compiled in April 2002 from those involved with the Workshop Chemistry Project, recipients of WPA awards, and those known as the non-funded Affiliates. Those Workshop Chemistry Project Affiliates who received WPA awards were considered WPA recipients.

At the end of the 2001-2002 academic year, PLTL Affiliates were surveyed for information on each course that has incorporated PLTL workshops. It should be noted that the results reported here are conservative: although more Affiliates are known to be using PLTL, only those responses received were counted.

Responses to the survey were received from 55 institutions. Not surprisingly, chemistry started out with a sizable number of Affiliates and courses, and has

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INCORPORATING PLTL IN A PHYSICS COURSE: AN EVOLUTION AT THE UNIVERSITY OF MAINE

Algebra-based introductory physics at the University of Maine, Orono, had undergone a transition starting in 1997, in which small group tutorial work replaced instructor-centered problem-solving during the recitation meetings. University of Washington material was used and some new tutorial materials were researched and developed. The instructor's role changed from classroom authority to facilitator engaging students in semi-Socratic discourse.

The Physics Education Research Laboratory at the University of Maine initially became interested in Peer-Led Team Learning (PLTL) after David Batuski, a physics faculty member (along with Rebecca Eilers, Dean of the College of Liberal Arts and Science (CLAS), and Mitchell Bruce, chemistry faculty) attended a PLTL conference in Miami in January 2000. Initially an internal grant funded by CLAS enabled Stephen Kaback, instructor for the algebra-based introductory physics course, to support four peer leaders for the Spring 2001 semester.

Assessment Study, Spring 2001

Side by side comparison data of tutorial sections with instructor and peers vs. instructor alone showed no difference in exam averages over four exams (data normalized).

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PROJECT NOTES: RESOURCE-FULL WEBSITES

An important part of the Peer-Led Team Learning Project is building a larger community organized around the theme of student-assisted learning. If you are involved with PLTL, then you might want to consider yourself as a resource, and with others on your campus, you should consider being a Center for PLTL.

As mentioned in this issue's lead story, on-campus dissemination — to colleagues in the same discipline, department, or in other disciplines or departments — makes a strong case for institutionalization and sustainability. Part of such an effort is visibility. Do you already have a course website? Perhaps it includes some mention of PLTL. Now is an excellent time to expand beyond the concept of the course website to a campus PLTL Center website, indicating that you are willing to be considered a resource for others who are interested.

For the overall National Dissemination Project, each campus having a PLTL presence would expand the dissemination effort. For instance, if someone types in "peer-led team learning" in a search engine such as Google.com, currently one will see a wide variety of pages that in some way mentions PLTL. Yet few have a link to the PLTL Project website.

A recent search found four sites that demonstrate useful components for a campus PLTL website:

Faculty: Mitsue Nakamura, University of Houston-Downtown
Discipline: Mathematics
A great example of how faculty can "advertise" PLTL on their personal web pages. It provides more than enough information for someone unfamiliar with PLTL—from workshop materials ready for downloading to a link to the Project site.
URL: http://cms.dt.uh.edu/faculty/NakamuraM/index.htm

Faculty: Joseph Grabowski et al., University of Pittsburgh
Discipline: Chemistry
A closely replicated version of Merv Griffin's own Jeopardy! It even has the theme song playing in the background. There are four categories: General, Organic, Biochemistry and a "Miscellaneous" version. It's a great way to review at the end of the semester.
URL: http://chemed.chem.pitt.edu/Jeopardy/

Faculty: Charles Mallery, University of Miami
Discipline: Biology
Eight comprehensively arranged units (some with multiple parts).
URL: http://fig.cox.miami.edu/~cmallery/150/workshops/workshops.htm

Faculty: Eldon Baldwin, Prince George's Community College
Discipline: Mathematics
Professional appearance and well organized—this site has a wealth of information. It is a course website and has many study tips and strategies, of which PLTL is one.
URL: http://academic.pg.cc.md.us/~ebaldwin/id55.htm

What components should be included in a campus PLTL website?

1. Faculty name(s), discipline(s) and contact information
2. Application form to be a workshop leader
3. The benefits of being a workshop leader
4. Schedule of local PLTL events for the semester/year, e.g., interview schedule, orientation, course schedule, etc. as well as links to PLTL Project events, e.g., conferences, regional workshops, etc.
5. Materials for group work for each course (no answer keys!)
6. A nice touch: A message board for leader and faculty exchanges (this should be open, to maintain an ongoing discussion)
7. Another nice touch: An explanation of PLTL workshops, perhaps including local evaluation data.

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Progressions: Peer-Led Team Learning
The Workshop Project Newsletter
Spring/Summer 2002, Volume 3, Issues 3 & 4

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Progressions (ISSN 1539-1752) is published four times a year by the PLTL Workshop Project.

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

SUBJECT: JOINING THE PLTL COMMUNITY

Dear Dr. Gosser,

I am writing to you on behalf of the Gateway Science Workshop Program at Northwestern University (IL). This program is funded by the Mellon Foundation and Northwestern University. We offer peer-facilitated workshops to undergraduate students in a variety of courses in biology, chemistry, physics and engineering. Students work on conceptually based, advanced problems in small groups of five to seven with a peer facilitator. We will be evaluating our program over the course of the next three years.

I was wondering if it might be possible for us to join the PLTL community and, if that was possible, how we might go about joining?

Denise Drane
Northwestern University

Dear Denise,

That sounds great and I am very interested to learn about your program at Northwestern. Of course we welcome you very much to our group: it is a network of people who are working in different facets of peer-facilitated instruction. We have annual national meetings in which many of those will attend - and would like to invite you and any members of your group to these meetings. Also, we have a Chautauqua program where we do two and one-half days of "training" of faculty and learning specialists new to PLTL.

I would be interested to learn more detail about your program: how did it start, how are students trained to be facilitators, how are the materials for the workshops written? Have you been doing this for a while or is the program just starting?

I would like to share your program and your experiences in our Newsletter "Progressions" (which is posted on the PLTL website).

Best,
Dave Gosser

Dear David,

Thanks so much for replying to my e-mail. Our team would really like to join your network and take part in your meetings.

Here's some background information on our program. We call it The Gateway Science Workshop Program because the workshop program was designed to boost the interest and performance (as well as increase retention) of students in science courses that are gateway courses to medicine, engineering and graduate study in science. The program is funded for three years by the Mellon Foundation in conjunction with Northwestern University. The Mellon Foundation has a particular interest in evaluating the impact of the program on underrepresented students (ethnic minorities and women) and students who come from small rural towns.

The program is based largely on the successful interventions of Uri Treisman and informed by Claude Steel's work on stereotype threat*. It was inaugurated in Biology 210 in 1997, using an experimental design to determine its impact. Specifically, in the case of majority students, it is possible to make a good prediction of a student's performance in Biology 210 based on his/her previous college grade point average (GPA). However, underrepresented students had consistently failed to achieve the Biology 210 grades that their prior GPA's indicated they were capable of making and considerable numbers were dropping out of Biology altogether.

In the experimental design, the performances of underrepresented and majority students were normalized to account for prior GPA as well as SAT scores. Control groups were established (control groups were historical in the case of underrepresented students, due to small numbers) and performance on Biology 210 exams was statistically analyzed. Workshop Program participants, including underrepresented students, earned substantially higher grades than both those who volunteered but did not participate, and students who did not volunteer for the program. Importantly, underrepresented students who participated in the workshops did as well as their prior GPA's predicted.

The program then expanded to physics and chemistry and more recently (2001-2002 academic year) to engineering. This year we have over 400 students per quarter involved in the program and 65 peer facilitators.

(Continued on page 4)

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Students meet once per week with a peer facilitator and work on challenging conceptually-based problems. Facilitators are students who previously completed the workshop program who have obtained A's or B's and who are interested in teaching. They currently attend several training sessions at the start of the academic year. However, we are piloting a quarter-long training program at the moment. Facilitators meet weekly with the professor who has written the problems to learn how they can best facilitate learning based on the problems and to ensure that they themselves understand key elements of the problems. The professor who writes the problems also teaches the course.

We have started formally evaluating the program and will continue to evaluate it over the next three years. So far we are looking at academic outcomes, retention and student and facilitator satisfaction with the workshop program (surveys and focus groups). We are also doing formal observations of the workshop sessions and the sessions in which the facilitators meet with the professors to discuss the weekly problems. We also hope to measure students' attitudes towards their particular discipline, self-confidence, and quality of their interactions with the instructor and their peers, as these factors have been shown to affect retention. We also hope to look at how the workshop program affects students' learning and learning styles.

We look forward to joining your network. We will be keen to learn about the experiences of other peer-led learning teams and hope that we can share some of the information that we have learned from our experience so far.

Best wishes,

Denise Drane
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Denise Drane is the Coordinator of Research and Evaluation, Gateway Science Workshop Program, Searle Center for Teaching Excellence.

H. David Smith, Associate Director for Research, Searle Center for Teaching Excellence at Northwestern University, (hdsmith@northwestern.edu) contributed to this article.

**For more information on stereotype threat, go to: http://www.theatlantic.com/issues/99aug/9908stereotype.htm.*

PROJECT NOTES: RESOURCE-FULL WEBSITES

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8. And, of course, a link to the PLTL Project website.

Have you looked at the PLTL Project website lately? It has undergone changes, and now includes a Peer Leader message exchange. Encourage your peer leaders to add their thoughts, and share their experiences and concerns. There is a list of Affiliates, arranged geographically to make it easy to see who else is "in the neighborhood." A listing of professional meetings and conferences is maintained on the "Events" pages. Please let us know of any meeting that should be added. The Dissemination Materials pages contain not only the Dissemination Manual (overheads and speakers' notes), but also samples of PowerPoint presentations and other materials to make presentations to a local or national audience. Please visit and give us your suggestions: all websites are works in progress!

David Gosser
City College of New York
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With help from Okason Morrison, Project Assistant.

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.

STEADY GROWTH IN IMPLEMENTING PLTL

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Fig. 1 - PLTL Courses by Discipline

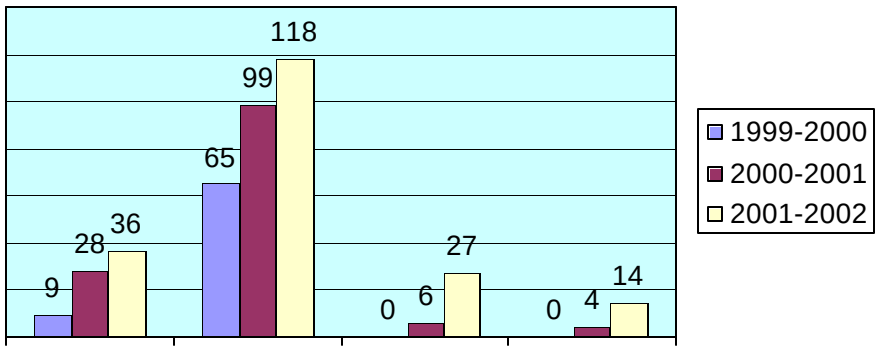
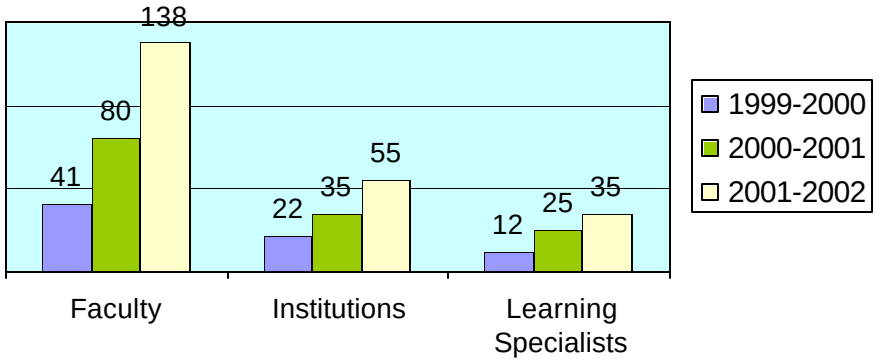


Fig. 2 -- Number of Faculty, Institutions, Learning Specialists Using PLTL Workshops



grown from 65 to 118 courses using PLTL by the Spring 2002 semester. (see Fig. 1) Mathematics and physics started with no courses in the first year, and have grown to 27 and 14 courses, respectively. Biology had a jump start, as two of the Co-Principal Investigators (PI) are biologists; the number of implementations has quadrupled, from nine to 36.

The PLTL Affiliates were contacted and in responding often provided information on colleagues in their departments, and in others, who have adopted workshops (see Fig. 2). The number of Affiliates grew from 41 in 1999, to 138 in 2002. This suggests that once a faculty member demonstrates positive results incorporating workshops in her/his course, colleagues are willing to try workshops in theirs. Intra-campus presentations may be a key to disseminating the PLTL model to colleagues.

It is encouraging to note that there has been a corresponding rise in the involvement of learning specialists, from twelve in 1999 to 35 in 2002. Many of the learning specialists provide training support for several faculty members in more than one discipline at their campus.

The number of peer leaders has doubled in the three academic years, from 700 to over 1,400 (see Fig. 3). The most amazing growth is in the number of students participating in workshops each semester: from 6,396 in 1999-2000, to 15,064 in 2002! Since PLTL is most often implemented in introductory science and mathematics courses, the growth potential for including workshops in more such courses, as well as in higher-level courses, bodes well for supporting student learning and understanding of course material.

AE Dreyfuss
PLTL National Dissemination Project Manager
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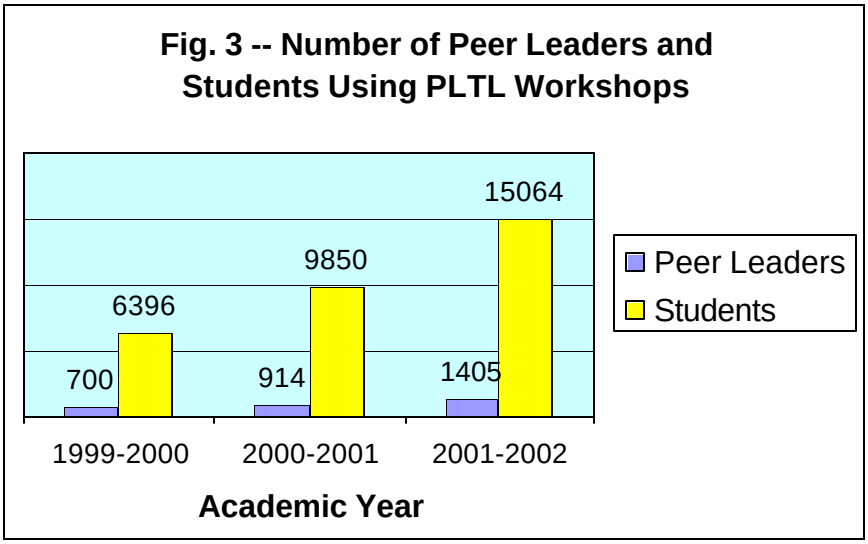
Fig. 3 -- Number of Peer Leaders and Students Using PLTL Workshops



REFLECTIONS ON *PROGRESSIONS*: SURVEY RESULTS

In the first survey of readers of the PLTL Project newsletter *Progressions*, a six-question form was included in the mailing of the Fall 2001 issue. Of the 653 forms sent to affiliates and the general mailing list, 51 responses were received (8%), representing 47 academic institutions, and departments as follows: 25 from Chemistry, four from Biology, seven from Physics and Earth Science, six from Mathematics, two from Education, and two "others," from 23 states.

In answer to the question, "Are you incorporating PLTL with courses?" 31 respondents said they were using PLTL or "doing it in some form."

Do readers circulate *Progressions*? Thirty-three responded they do within their department, 13 said they circulated copies to other departments, and nine respondents said they passed on copies to their peer leaders. One respondent commented: "If I feel something will be useful to other education/special ed faculty or to students..."

What do readers find most engaging in *Progressions*? This question was open-ended and elicited the following: Both "training" and "incorporation at new institutions" received twelve responses, followed by "research effectiveness" (9), "student leader comments" (4), "research on student learning" (2), "teaching/learning strategies" (1), and "involving administration" (1).

What would readers suggest for future topics? The list was extensive! Many readers provided additional thoughtful comments.

Implementation

- Case histories of implementation; success stories; challenges; "How-to" features; "How we got started at our institution," including at community colleges;
- Strategies for finding funding to pay workshop leaders;
- Strategies for building in the meeting time for workshops into students' class schedules: "Voluntary sessions with workshop leaders, as I have used, seem less ideal than workshop sessions scheduled into a student's course load and weekly schedule. Scheduled, required workshop sessions may require approval of university curriculum oversight committees and could be challenged due to their impact on course credit weightings, and the added complexity of yet one more meeting time to include in a student's schedule."
- Obstacles to implementing PLTL; convincing faculty colleagues: Several respondents commented that their sharing of *Progressions* has fostered interest in other departments. Some noted that PLTL workshops were included in pending proposals for a variety of courses at their institutions. The ideas of peer-led team learning are included: "Ideas from your project have been used in active learning activities in 100 level majors and non-majors courses."
- "Though I don't practice PLTL on as big a scale as others do, I appreciate the motivation and support I receive in the form of the *Progressions* newsletter. I intend to grow my program in the future, and having the newsletter 'library' to look back through is going to help immensely. Thanks!"
- "Thank you! There are lots of us out here trying to figure out how to run our own PLTL programs, and we appreciate learning what others are doing."

Training

- Successful PLTL mentor training models/components
- "I'd like to see articles about leader training that suggests way to train leaders without lecturing at them. "

Materials

- Development of workshop materials
- What makes a good workshop problem set? How do you design workshops for group work?
- Adaptations of workshop materials to fit specific institutions

Assessment

- "Look at variety of outcomes in a rigorous way - retention, performance, performance in subsequent courses; and leader outcomes like performance and recruitment to teaching."
- "I work a lot with teaching models that function on positive incentive, or at least minimize negative incentive. I'd like to see other people's thoughts on this type of teaching."

Other comments

- "I have found most of the articles to be engaging, whether they are about workshops, techniques, or written by leaders, trainers, or students."
- "I read almost everything. I like the mix of theory, results discussion, elaboration and reprise of key ideas."
- Very impressive effort
- Progressions = good!
- Keep it up! This is a primary route for me to feel connected to a movement.

One person responded that he found "Project Notes" the most engaging feature. David Gosser was very pleased.

HUMAN ANATOMY AND PHYSIOLOGY II

This workshop was developed for the PLTL workshops at the Human Anatomy and Physiology Society Annual Conference, held in Phoenix, Arizona, May 25-30, 2002, by Joseph Griswold and Daniel Lemons, Department of Biology, City College of New York. CCNY Workshop Leaders Marven Lamarre and Michael Tubon led the workshops.

1. **As a group, using the "Round Robin" technique** (where each person in the group answers a question in rotation), define the following terms:

heart rate

stroke volume

cardiac output

ejection fraction

interbeat interval

depolarization

automaticity

innervation

neurotransmitter

autonomic

2. **As a group**: list the two branches of the autonomic nervous system and the neurotransmitters released by each.

3. **Working in pairs** (one person explains, the other listens), rewrite each question in your own words:

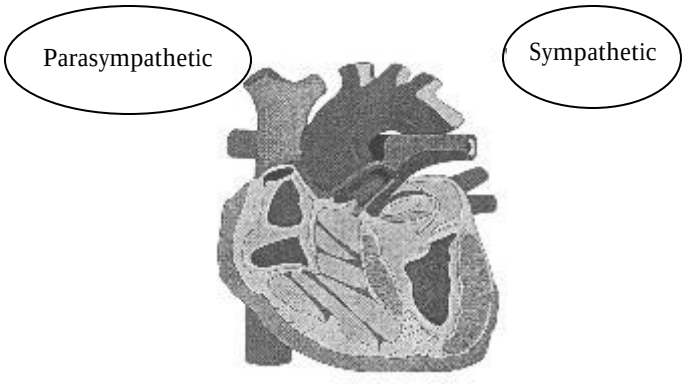
A. action potentials from the sympathetic nerves reaching the SA node:
this answer is right/wrong because:

B. spontaneous depolarization of the AV nodal cells
this answer is right/wrong because:

C. an inrush of sodium ions into SA nodal cells
this answer is right/wrong because:

D. spontaneous depolarization of the SA nodal cells
this answer is right/wrong because:

4. **Working in pairs:** Draw the sympathetic nerves to the heart in red, and the parasympathetic nerves in black. Be careful to draw them to the specific regions innervated by each.



5. **Working in pairs:** An individual has a resting cardiac output of 6000 ml (6L) and a resting heart rate of 60 BPM.

a. What is her stroke volume?

b. Measurements done under resting conditions reveal that her end diastolic volume is 120 ml. What is her ejection fraction?

c. During moderate exercise such as walking, her heart rate climbed to 110 BPM, end diastolic volume increased to 125 ml and ejection fraction was 80%. What was cardiac output under these conditions?

d. One day this individual noticed that her heart was beating very rapidly while she was studying at home. She went to a clinic and a doctor found that her heart rate was 150 BMP and her cardiac output was 8000/ml/min.

i. What is the term for such a condition when heart rate is abnormally high?

ii. What was her stroke volume when she went to the clinic? Show your work.

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iii. Compare the stroke volume at the clinic to the one at rest, and explain why there was a difference.

6. **Whole group discussion**.

Below on the left are changes that will lead to one of the effects listed below in the right column. Use the answers as often as needed. You do not have to use all of the answers provided.

The causes below lead to:	**one of these results:**
___ increased venous return to the heart	AB. Decreased heart rate
I chose this answer because:	AC. Increased heart rate
	AD. Increased contractility
	AE. Increased contractility and heart rate
	BC. Increased end diastolic volume
___ increased ventricular intracellular calcium	BD. Decreased end diastolic volume
I chose this answer because:	BE. Decreased heart rate and Increased contractility
	CD. Decreased contractility

___ active sympathetic nerves in ventricles
I chose this answer because:

___ active parasympathetic nerves in SA node
I chose this answer because:

___ large interbeat interval
I chose this answer because:

___ active sympathetic nerves in the SA node
I chose this answer because:

___ intravenous injection of norepinephrine
I chose this answer because:

___ intravenous injection of acetylcholine
I chose this answer because:

7. **Start this section working in pairs, then have the whole group share responses**.

Rewrite the question in your own words.

A partial failure of the aortic semilunar valve would likely lead to some reduction in:

A. end diastolic volume
This answer is right/wrong because:
B. cardiac output
This answer is right/wrong because:
C. ejection fraction
This answer is right/wrong because:
D. aortic blood flow
This answer is right/wrong because:

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BREAKING NEW GROUND AT HAPS

In Arizona, you can ask anyone to describe the weather and they'll tell you "It's a dry heat." From the 25th to the 31th of May 2002 the *Human Anatomy and Physiology Society* (HAPS) held its 16th annual conference in Phoenix, Arizona. However, it was Peer-Led Team Learning (PLTL) workshops that created more of the heat by "blazing new trails." HAPS members are educators in the field of Anatomy and Physiology and their annual meetings promote the exchange of new happenings in the field (technology, reference materials, educational tools, research) among members and meeting participants.

Joseph Griswold (Co-PI of the PLTL National Dissemination project) and Daniel Lemons, both Biology professors at the City College of New York (CCNY), and CCNY biology peer leaders Michael Tubon and I were in attendance. On the first day of the conference that Michael and I attended, conference participants were invited to breakfast and a new technology/educational materials exhibition. After that the educators attended meetings and we, the peer leaders, took the opportunity to work off some jet lag by exploring our new surroundings in Phoenix. Although it was Memorial Day and not much was happening, the new environment was a sight to see for us Easterners.

Later that afternoon we reconvened with our professors and were briefed on the workshop we were to help present over the next two days. As a bonus we were each given a brand-new Human Anatomy and Physiology textbook, courtesy of McGraw Hill Publishers, and we "hit the books." As the evening approached we got a little dressed up and ventured down to the HAPS banquet. We mingled with the attendees and we even met the current President of HAPS, Bill Perrotti. That is where Michael and I learned that we were the first students to attend a conference in HAPS history: we were breaking new ground! We also met prospective attendees of our upcoming workshops and gave them some details about our experiences using PLTL, but we didn't give everything away because "you always have to keep them wanting more."

the temperature was 100^0: we knew that the time for our first workshop was fast approaching. We boarded a bus going to Phoenix College where our workshops were to be held and got to talking with more attendees as we kept on spreading news about the PLTL program. Once we were at the college we were treated to a continental breakfast and we continued our preparations. At lunch we met up with our professors once more to address our last minute concerns. Finally, the clock struck four and we entered our designated workshop room, both of us a little nervous. However, once we heard the words "it's time to experience PLTL for yourself," we snapped back into action just like we were back home at City College.

Two groups were formed from the participants, ending up in groups of nine, which is fairly close to our PLTL standards. We performed an icebreaker to get everyone acquainted with each other and to remove some of the tension caused by the heat. As we saw everyone was comfortable (and smiling), Michael and I handed out the workshop material to our groups and got down to work (see Workshop Exercise, page 7). As we approached each section we would suggest what we felt would be the best way to proceed. The participants made excellent transitions from the role of educator to student, perhaps a difficult task. We found that the experience was greeted with laughter, exclamations of realizations, and camaraderie among the participants, who might have been complete strangers until that day. Bill Perrotti even made an appearance and thought it went well.

After the second day's workshop, which went just as smoothly, Joseph Griswold, Michael and I relaxed by taking in much of what Phoenix has to offer (Phoenix Zoo, Scottsdale Fashion Square Mall, Frank Lloyd Wright's Taliesin West) because "when you work hard you got to play just as hard." Our stay in the great city of Phoenix was coming to a close. The next day we bid farewell to our professors and boarded the plane back to New York. Even though our trip seemed so short, the new ground that we

(Continued on page 10)

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LEADING WORKSHOPS AT BROOKLYN INTERNATIONAL H.S.

"As a tutor, I have learned that listening requires more energy than speaking. By listening to students' explanations, tutors can identify students' thinking process. And by asking the right questions, tutors can motivate students to be more active in learning."

The Workshop leaders were prepared to deal with diverse learning styles and encouraged collaborative problem-solving among the students. They were equipped with the teaching and learning techniques necessary to create a supportive environment that helped each student build understanding in mathematics.

New York City College of Technology (NYCCT) students who took the Peer Leader Training course at the City College of New York (CCNY) via videoconferencing have had an opportunity to tutor students in mathematics at the Brooklyn International High School. Once a week during the Spring 2002 semester, these students helped prepare 9th and 10th grade students for the Mathematics Regents A* examination. This experience gave students the opportunity to apply the Workshop model at a local high school.

These NYCCT students are also enrolled in the Teacher Preparation Program at CCNY (Ellen Goldstein, Co-PI). As part of the program, they are required to take the Peer Leader Training course as an introductory course to teaching. These students are mostly associate-degree computer science majors interested in teaching mathematics. They then are encouraged to transfer to CCNY and complete their Bachelor's degree.

The Brooklyn International High School, located at the foot of the Manhattan Bridge in Brooklyn, New York, is a small public high school for recent immigrant students who are beginning to learn English. The mission of the school is "to assist new learners of English in developing their linguistic, intellectual, cultural, and collaborative abilities so that they become active participants in today's interdependent worlds." One of the special features of the school is that there are small classes that have thematically-linked instruction in a collaborative environment.

The Workshop leaders felt that the Peer Leader Training course had provided them with the knowledge and techniques needed to work with these high school students. The Workshop leaders were prepared to deal with diverse learning styles and encouraged collaborative problem-solving among the students. They were equipped with the teaching and learning techniques necessary to create a supportive environment that helped each student build understanding in mathematics.

Yong Chen found the session on cultural diversity especially helpful because of the student population at the International High School. Yong is one of the first Mathematics Workshop leaders who took the Peer Leader Training course in Spring 2001. He says, "It helped me understand that as an educator one should understand one's students' cultural backgrounds, because it will be useful when one teaches students of different races in the same classroom. Then based on this awareness, I was able to choose what kind of curriculum and activity they comprehended and needed."

Beili Wang, another Mathematics Workshop leader, changed her method in tutoring after she took the training course. She states, "The communication skills that I had learned in the Peer Leader Training course have changed my approach in tutoring students. As a tutor, I have learned that listening requires more energy than speaking. By listening to a student's explanations, tutors can identify a student's thinking process. And by asking the right questions, tutors can motivate students to be more active in learning. It is very hard for tutors to achieve this goal. For example, most of time, I feel I have the intentions to speak and to give hints quickly. At the Brooklyn International High School, if more students want to go to the board to solve the math problems collaboratively, I feel the more successful my tutoring session is."

The opportunity to work in a high school provided several Mathematics Workshop leaders a rich experience in applying what they have learned, which will serve them well in their future teaching careers.

Janet Liou-Mark
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**Passing Regents' exams is required in New York State to obtain a high school diploma*

NEW GROUND AT HAPS

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broke to plant the seeds of PLTL in a new field of Biology will grow for much longer: we've already received requests for more information.

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THE GENDER ISSUE IN SCIENCE AND ENGINEERING: WILL THERE EVER BE EQUILIBRIUM?

The workplace of the 21st century is composed of more women in more positions than ever before. Assumptions about the workplace that workshop leaders will find themselves in should take into account a shift from a presumption of male dominance to the recognition of potential female dominance in science and engineering (S&E).

The greater participation and utilization of women in S&E fields in the United States started in the late 1970's and rapidly increased thereafter (Huang, et al., 2000). It is no longer a surprise for college students to be educated by female professors. Yet, we observed that the number of male workshop leaders often outnumbers the number of female leaders at the City College of New York (CCNY) and this "dipole moment" is reflected in most of science and engineering courses in college as well as in industry. Rates of participation of women in science and engineering are affected significantly by economic globalization and demographic factors. This research paper* is designed to provide sufficient information to help us to answer the question of whether equality between the genders will be established in science and engineering fields of study and in the workplace. The awareness of this potential equilibrium should help to improve the workshop model, where peer leaders can support and encourage both female and male students to succeed in S&E disciplines.

The main reasons that there is underrepresentation of women in science and engineering in the United States are educational issues, with emphasis on the low rate of participation of women in the various fields of science and engineering; employment conditions in the work force; and psychological issues.

Educational Issues

Gender differences in choice of academic majors and future careers are apparent in the early years of college. For example, a national study of first-year students found that women of all racial and ethnic groups were less likely than men to choose to study S&E (Astin, et al., 1994). Even among those who had chosen to study S&E, fewer women than men were willing to pursue a career as an engineer or research scientist. We have indeed observed this situation in our science and engineering classes at CCNY. There are far fewer females in computer science and engineering classes than males and on average, male professors usually teach these classes.

In 1996, women received 55 percent of all bachelor's degrees (Hill, 1999) and 47 percent of all bachelor's degrees awarded in science and engineering. "From 1966 to 1996, the proportion of women among S&E degree earners rose dramatically: for bachelor's degrees, it rose from 25 percent to 47 percent." However, their degrees were not evenly distributed among S&E fields.

Women as a percentage of Science and Engineering Bachelor's by field, in 1966 and 1996

	1966	1996
Engineering	.4	17.9
Math & Comp Sciences	33.2	33.9
Physical Sciences	14.0	37.0
Biology & Agriculture	25.0	50.2

(Source: Hill (1999a), Science and Engineering Degrees: 1966-1996 (NSF 99-330) tables 11, 18, and 25)

Women are increasingly involved in the sciences, although there is a popular perception that the S&E fields are dominated by men. Consistent with the degree award data, enrollment statistics also suggest a narrowing gender gap. A recent National Science Foundation Survey of Graduate Students and Postdoctorates in Science and Engineering (Burelli 1998) indicates that, while the number of men enrolled in graduate S&E programs fell three percent from 1995 to 1996, the number of women rose one percent (these percentages hold even when the students enrolled in social sciences and psychology are not counted).

Employment Issues

In 1971, 91 percent of male scientists and engineers were working full time in occupations that were related to their training, while 71 percent of female scientists and engineers were likely to have full-time employment in S&E fields (National Academy of Sciences, 2000). Since 1973, levels of full-time employ-

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Women are increasingly involved in the sciences, although there is a popular perception that the S&E fields are dominated by men. Consistent with the degree award data, enrollment statistics also suggest a narrowing gender gap.

The research performed in that case was clearly intended to try to prove that women, not men, are deficient. The way in which the research was conducted is in itself a case of discrimination. Why not focus on male thinking and behavior and prove that it may not be flawless?

Seeing that the human brain, whether male or female and without loss of generality, can perform equally well when given the opportunity to do so, implies that intelligence or simply being 'smart' is not the only thing to consider.

The equilibrium, if any, can be calculated using the exponential growth formula, and according to the formula calculations, the number of years needed to reach equilibrium falls between 25-30 years, in other words, in the next generation.

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ment in S&E for men have decreased in all fields with an overall rate of 85 percent in 1995, while rates for women improved by nearly ten percentage points. While there is some variation across fields, by 1995 gender differences in all fields had been reduced to around 10 points. Still, this is an important difference, representing one out of ten women with a doctorate in science and engineering.

Theoretically, the gender gap in S&E achievement and attainment was a result of psychological and sociocultural influences, which discouraged women from involvement in an area that has been traditionally dominated by men. Economic resources and material support were not a significant issue in dealing with the gender gap. The analysis presented above of the overall sample data found that a broad gender gap only narrowed to a limited extent after predictor variables were entered into the equations. In other words, those predictor variables did not account well for the lower S&E entry among women. This finding led to questions as to whether there was some cultural value that backed females' venture into S&E areas, or, alternatively, environmental factors that fostered females' intellectual orientation in terms of postsecondary program choices. Perhaps there were unique joint effects among family expectations, females' academic preparation, and their school conditions. In an issue of a popular journal, a story by Schreiber (1993) entitled "The Search for His and Her Brains" gives us an explanation of the social conceptualization about gender differences and biological determinism. According to Anne Fausto-Sterling, Ph.D., a developmental geneticist at Brown University, quoted in the Schreiber article, "It's easy for us to see how racial and sexual attitudes affected earlier generations of scientists, but it's harder for people to see that beliefs about sexual differences are still so strong that few scientists can move outside them."

Biological Determinism?

Women have struggled throughout much of history to gain status and parity. It is apparent that the differences between men and women have made them grow separately, seeking pathways that would benefit them in their lives and would thus have the effect of main-

question on equilibrium, although answered in part with statistics, also relies heavily in its explanation on another important factor, namely the reason why women have chosen other career orientations in greater number than men have. This trend is highly noticeable in the sciences, which is our main area of study.

Who is better as a scientist or engineer? This question, on our part naïve and defiant, was a starting point to our investigation. So, by looking at various studies to prove or disprove such a query, our investigation of this question led us into discussions of processing differences. Studies in brain research have tried to explain differences with experimental data, discriminatively searching for a flaw in the structure of the female brain. Magnetic Resonance Images (MRI's) taken of male and female brains while in the process of thinking and comparing sounds showed some quite interesting results. Male and female brains behave differently while doing similar tasks yet they are both capable of doing equally well. The research implies that "nature has provided the brain with different routes to the same ability." (Wade, 2000, 132). Believing in the existence of a 'better brain' may not be a wise hypothesis.

The undertaking of such research was clearly intended to try to prove that women, not men, are deficient. The way in which the research was conducted is in itself a case of discrimination. Why not focus on male thinking and behavior and prove that it may not be flawless?

Psychological Issues

It is apparently true that in everyday life there is discrimination, so it is also obvious that the environment has presented, as stated by Vivian Gornick, "the conditions of work under which women in science have felt invisible and discounted, left out and whittled down." As expressed by a sixty-eight-year old physiologist who actively participated in college research, these 'conditions' include working with men who "never walked into my office to talk to me, who nodded to me in the hall as they nodded to the maintenance men or the cleaning women, never invited me to their conferences or their seminars or their research programs. I was the invisible woman in science." (Gornick, 1983) Such situations

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have been common, still affecting women today.

It is not surprising to see how women's self-esteem can be harmed by such disregard. Schreiber (1993) noted, in a sidebar entitled "The Myth of the Math Gap" how changes in learning environments can help girls to perform as well as boys when social pressures on girls are eliminated.

Hypothesis: Equilibrium in the Next Generation?

As aspiring scientists, the best option that we may consider in order to prove a theory or finding will be based on the use of the scientific method. This method serves as a means of fact recollection, summary of facts or data, theory construction, performance of experiments and finally, theory acceptance or rejection. Developing our own 'theory' is also a good way of finding a reasonable answer regarding our research question. In fact, we would like to make a "contribution to successful science." Making our 'science' successful can rely on the fact that, "for the purposes of science, all schemes of organization that allow us to make good sense of things are equally worthy." (Elgin, 1995, p. 295)

Given our initial set of data and with some analysis, we were able to draw some initial hypotheses. We were able to consider the quite obvious fact that women are definitely not participating in the sciences as much as men are. Seeing that the human brain, whether male or female and without loss of generality, can perform equally well when given the opportunity to do so, implies that intelligence or simply being 'smart' is not the only thing to consider. So, we decided to seek further.

We decided to look at a collection of statistical information. After examining the overall trends and making conjectures about what the future would be like, we questioned ourselves, 'Will there be equilibrium?' This hypothesis turned out to be our main theory. We set out to determine a reasonable answer to our theory, a reasonable answer that has some scientific basis. The data reflect the increase in the number of females involved in the sciences over the past few years. Will this rate increase be sufficient and will it reach our proposed equilibrium? Through our study, we were able to make an estimate on the time that it would require to reach such a state of equality. The equilibrium, if any, can be calculated using the exponential growth formula, and according to the formula calculations, the number of years needed to reach equilibrium falls between 25-30 years, in other words, in the next generation. Unfortunately, our theory can only be proven when indeed this 'balanced' situation is in fact reached. So, our theory is more like an educated guess. Ultimately, this means that the true answer to our question will have to wait for the implied result to occur and Hoversten, "Someone puts forward a hypothesis and it either sinks or swims." As in science itself, many situations can only be studied and reasoned well enough with the hope of finding a better solution in time, or with future results confirming an initial hypothesis. To accelerate the arrival of our proposed equilibrium, peer leaders should provide support and instill confidence, knowing that every workshop student can excel within the group.

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* Final Project for Leader Training Class, Spring 2002.

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INCORPORATING PLTL IN A PHYSICS COURSE: AN EVOLUTION AT THE UNIVERSITY OF MAINE

(Continued from page 1)

Implications of research suggested that interactive engagement (IE) may be at the root of more meaningful student learning. A comparison of sections with peer leaders to sections without (but still doing IE activities) showed no difference in student performance in comparison studies between IE v. traditional instruction.

Changes to implementation of peer led workshops (funded by a WPA grant) included:

- a longer training period each week for the peer leaders (peer leaders develop a higher level of content mastery);
- emphasis on the role of the peer leaders as a resource and guide, but NOT an authority;
- longer time dedicated to training in team dynamics;
- facilitation training for specific parts of the tutorials.

In the training sessions, peer leaders and graduate TA's work together covering the material in the same way the students will be doing in the following week. Batuski, Kaback, and Michael Wittmann acted as facilitators to model appropriate facilitation strategies for the peer leaders and instructors.

Assessment Study, Fall 2001

Again, research was set up as side-by-side comparisons between instructor and peer leader tutorial sections v. instructor-only sections using exam averages of four exams as assessment criteria. The data showed an absolute difference between the exam averages of the three sections with peer leaders and the two without. More closely analyzed data identified some interesting results; of particular interest:

1. The absolute difference between PLTL and non-PLTL sections in Fall '01 was an improvement over the complete parity between the groups in the previous semester, Spring '01. Although we had five sections of algebra-based introductory physics participating in the study, our comparison between two sets of two sections (two in control group [no PLTL] and two in treatment group [PLTL]; n = 84), showed an increasing difference in exam scores favoring PLTL as the semester progressed. This maxed out at a four-point higher average score for PLTL sections by the third (of four) exams.

2. One PLTL group with a much lower incoming math GPA (our means of profiling group aptitude) started off doing comparably to all other groups on exams but ultimately performed at the lowest level even with peer leaders available to the section. We are investigating possible reasons for this phenomenon (it may be just an anomaly).

3. In tracking student performance over the year, we found a very significant difference in exam performance in the second semester of the course. Although all students had peer leaders for the Spring '02 semester, those who had already had peer-led workshops in Fall '01 scored up to an average of nine points better on exams than students participating with peer-led workshops for the first time. We will see if this effect persists in this upcoming academic year.

Qualitative Assessments

Students are more satisfied with the peer leaders as indicated by solicited and non-solicited comments. Observations in tutorial section meetings demonstrated a qualitative improvement in student-peer interactions and peer-instructor interactions. Quantitatively more team meetings are occurring outside of class with more students per peer leader (although the number of meetings and students attending typically increase as the time before the next exam decreases). There is a continuing interest in:

- a refinement of our understanding of the peer leaders' role. There is an impact on student learning when peers are present during small group work. We are trying to isolate factors that make peer leaders work or not work toward improved learning;
- influencing science and math majors who are participating in the peer leader project toward teaching as a career possibility. Student leader surveys (n = 15)

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RESULTS OF SIX ROUNDS OF WPA AWARDS

The first round of Workshop Project Associate (WPA) grants was in Fall 1999, and the sixth round ended in May 2002.

WPA recipients have received a total of $357,687, and have themselves raised $376,788 in matching funds.

Guidelines and new award dates are posted on the PLTL Project website, www.pltl.org under Workshop Project Associate Grants.

BIOLOGY
- 13 WPA awards
- 7 at two-year colleges
- 6 at four-year colleges
- Total funds awarded: $69,649
- Total funds matched: $109,912
- Number of Faculty: 15

CHEMISTRY
- 33 WPA awards
- 12 at two-year colleges
- 21 at four-year colleges
- Total funds awarded: $192,031
- Total funds matched: $231,923
- Number of Faculty: 37

MATHEMATICS
- 8 WPA awards
- 4 at two-year colleges
- 4 at four-year colleges
- Total funds awarded: $44,675
- Total funds matched: $22,630
- Number of Faculty: 10

PHYSICS
- 7 WPA awards
- 2 at two-year colleges
- 5 at four-year colleges
- Total funds awarded: $51,332
- Total funds matched: $12,323
- Number of Faculty: 8

CONGRATULATIONS, PRATIBHA!

Pratibha Varma-Nelson, Co-Principal Investigator of the PLTL National Dissemination grant, and administrator of the Workshop Project Associate grant program, has been appointed Professor of Chemistry, and Chair of the Chemistry, Physics & Earth Science Department, at Northeastern Illinois University, in Chicago, IL, effective July 1, 2002.

Two of her new colleagues, Dr. Ana Fraiman and Dr. Veronica Curtis-Palmer, will be introducing PLTL workshops in Organic Chemistry in the Fall of 2002, and subsequently introducing them to other courses in Chemistry, and later into the fields of Physics and Earth Science.

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PLTL PHYSICS AT THE UNIVERSITY OF MAINE

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indicate that students who had not considered teaching are now considering it after experiencing "the other side of the fence."

In the face of a serious math and science teacher shortage, we are interested in the potential for PLTL to act as a medium to funnel good students toward education. Some peer leaders already anticipated teaching after college; others not. Of the ten students in the "not" category, three have indicated that they are now considering teaching as a possible part of the career trajectory.

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RESEARCH QUESTION FROM *PROGRESSIONS*' SURVEY

"I wonder if a study has been done to see if it's the use of peer leaders or the specially written materials that makes the difference in success and attrition?

The article about PLTL at the University of Kentucky (*Progressions, Fall 2001, V. 3, No. 1*) was comparing PLTL with other chemistry classes with less time - no recitations at all in the "control" group. Therefore, is it PLTL or more time?"

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 are looking for contributions. Please submit announcements of upcoming events, articles, or pertinent concerns you would like addressed.

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Calling All Peer Leaders!

- Looking for information on preparing for workshop?
- Wondering how to lead a successful workshop group?
- Needing a tip for a problem in your workshop?
- Trying to find out the benefits of becoming a workshop leader?
- Figuring out how to bring workshops to your other classes?

Visit the new Peer Leader Exchange on the PLTL website!
The Peer Leader Exchange is designed to allow us to share useful information on leading workshops. There are also links to research articles previously published in the *Progressions* newsletter.
Share your insights and ideas with fellow leaders!
Join the conversation by going to:
www.pltl.org and click on Peer Leaders' Exchange, Message Board

DISSEMINATION GRANT PROJECT LEADERSHIP

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