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PEER LEADERS' VIEWS ON A GENERAL CHEMISTRY WORKSHOP PROGRAM

A.E. DREYFUSS AND JANET LIOU-MARK

Peer-Led Team Learning (PLTL) is a "curricular structure" (Gosser and Roth, 1998) developed in the early 1990s at the City College of New York (CCNY) of the City University of New York (CUNY) because faculty wanted to improve their students' pass rates in the Chemistry courses they were teaching. In addition to the lecture sessions by faculty, a weekly *Workshop* session is led by a Peer Leader, a student who has previously taken the course and performed well.

The Peer Leaders, for the Peer-Led Team Learning program in General Chemistry at CCNY, are recruited, interviewed, selected, and trained to lead a workshop, a collaborative learning environment for a group of students. General Chemistry I and II have had an enrollment between 600-800 students every Fall and Spring semesters. For most students, the course is a requirement for their science and engineering majors. Each semester, there are six faculty members who teach the course – four for the first semester sections, and two for the second (not all students are required to take both General Chemistry I and II).

The peer-led workshop sessions are separate from the lecture and laboratory sessions, and workshop groups are composed of eight to twenty students. During the first semester of leading workshop, Peer Leaders also participate concurrently in training through a one-credit course, thus combining practice with training. After one semester of serving as a Peer Leader, workshop leaders are considered *experienced*. A Peer Leader has the option to continue serving in this role, or may decide to stop for a semester or more. After serving for two semesters, Peer Leaders may apply to become a *Liaison* who oversees a group of Peer Leaders who are working with one of the six faculty members. The liaison supervises the new and experienced Peer Leaders (between eight and twelve) and communicates with the faculty member ensuring that weekly quizzes are prepared to be administered during the workshops. The responsibilities include recording workshop grades and observing workshop sessions. A liaison may then apply to become the program's *Coordinator* – an experienced Peer Leader who has served as a liaison. The coordinator is in charge of scheduling all the workshops sections (there are about 60 workshops, held both during the day and in the evening), supervising the liaisons, and overseeing the day-to-day running of the program. Interview and selection processes for the liaisons and the coordinator are similar to those conducted with first-time Peer Leader candidates. These positions are all held by undergraduates who are still pursuing their own studies.

Research on Peer Leaders

Amaral and Vala (2009) conducted a study of Peer Leaders, called *mentors*, and “examined the relationship between *mentoring* and the achievement gains of the *mentors* using grades in subsequent subject-matter courses and the retention of the mentors in these courses” (p. 631). They concluded: “...Programs that encourage student leadership should be considered an important aspect of any undergraduate science curriculum” (p. 633). Their study examined the benefits to Peer Leaders as *students* in terms of their cognition of science content.

Studies by Frey, Brown, & Sawyer (2009) examined the type of discourse used by Peer Leaders during workshop, and Streitwieser & Light (2010) investigated the interest in teaching by Peer Leaders. Other research conducted on Peer Leaders looked at the effect of the experience in terms of personal attributes and development. Gafney and Varma-Nelson (2007) surveyed former leaders (1995-2003) from 11 institutions (n=119 respondents) through an online survey.

[The study]...measured the long-term impact on Peer Leaders and found that “participating in workshops” and “acting as a Peer Leader” were among the most productive learning experiences for them. Peer leaders stated that it increased their confidence in entering science-related careers and made them more effective as they interacted with people in a wide range of situations (p.538).

How do Peer Leaders feel about their role organizationally? What motivates them to serve? Specific questions were devised by Dreyfuss (see Appendix A) who supervised the selection and training of Peer Leaders for ten years for the PLTL program in General Chemistry at CCNY.

Method

In the Fall 2008 semester, a survey form with seven questions was administered to Peer Leaders who led workshops in either General Chemistry I and II. Additional questions were added to the survey form in the Spring 2009 semester. The survey forms were distributed by the *Liaisons* three weeks before the end of the respective semesters, and returned to the *Coordinator*. More than half of the Peer Leaders in both semesters responded to the surveys: 39 respondents in Fall 2008 and 33 in Spring 2009.

Results

The Peer Leaders responded to questions regarding their majors, length of time they had served as Peer Leaders, and their roles. In the fall 2008 semester, 33% were first-time Peer Leaders, 26% were in their second semester, and 41% were in their third or more semester. First-time Peer Leaders comprised 42% of the Spring 2009 semester, 24% were in their second semester, and 33% were in their third or more semester of service (Table 1).

Table 1. Number of Semesters Peer Leaders Served (Fall 2008 and Spring 2009)

How many semesters have you served as a Peer Leader?				
	Fall 2008		Spring 2009	
First time	13	First time	14	
Second time	10	Second time	8	
Third or more:	16	Third time	3	
		Fourth time	3	
		Fifth time	1	
		Sixth time	2	
		Eighth and tenth	2	
Total:	39	Total:	33	

First-time Peer Leaders may only lead one workshop in their first semester, but may lead more in subsequent semesters. Table 2 summarizes the number of workshops the Peer Leaders are leading by the respective semesters.

Table 2. Number of Workshops Led by Peer Leaders (Fall 2008 and Spring 2009)

How many workshops are you leading this semester?		
	Fall 2008	Spring 2009
One workshop	32	24
Two workshops	6	7
More than two workshops	1	--
No answer	--	2
Number of respondents	39	33

Because General Chemistry is a required course for both science and engineering majors, there are nearly equal numbers of majors from science and engineering in the Fall 2008 semester (Table 3). A "Post-baccalaureate" is a student who already has a Bachelor's degree and has decided to change fields where science courses are a requirement to pursue graduate studies.

Table 3. Majors of Peer Leaders (Fall 2008)

What is your major? (N=39)			
Science		Engineering	
Biology	10	Chemical Engineering	6
Biochemistry	3	Civil Engineering	4
Chemistry	3	Electrical Engineering	3
Pre-med	1	Mechanical Engineering	3
Post-baccalaureate	1	Computer Engineering	2
Undecided	1	Bio Medical Engineering	2
Total	19		20

Peer Leaders were paid approximately \$500 per semester to lead a workshop (1995-2005), although the amount was changed to an hourly rate, around \$10/hour, to lead a two-hour workshop and one hour of workshop “preparation” for 15 week semester (from 2005 on). Because the institutional budget for Chemistry workshop leaders was noticeably larger than “temporary” workers in the other departments, the budget to pay workshop leaders was often criticized as extravagant. Peer Leaders were asked for their opinion regarding payment. Surprisingly, 41% said they would serve even if they were not paid (Fall 2008), and 54% responded the same way (Spring 2009). Similarly, about half said they were willing to be paid less than the \$500 a semester (Table 4).

Table 4. Payment of Peer Leaders

What are payment suggestions?						
	Fall 2008			Spring 2009		
	Yes	No	N/A	Yes	No	N/A
Would you serve if you were not paid?	16	22	1	18	13	2
Paid less than \$500/semester	16	18	5	16	16	1

While one person responded that \$1,000 would be an appropriate amount for payment, most Peer Leaders felt that \$450-\$500 was suitable. However, lesser amounts were also proposed (Table 5).

Table 5. Amount Considered for Payment by Peer Leaders

What would be the lowest amount you would consider?		
	Fall 2008	Spring 2009
\$1,000	-	1
\$500	7	15
\$450	15	2
\$400	4	3
\$350	1	-
\$300	2	-
\$250	-	1
\$15/hour	1	-
\$10/hour	1	-
Zero	2	6
N/A	6	5
	39	33

Alternative forms of compensation were offered and several suggestions proved popular (Table 6). For example, service to the college on their transcript received over 70% approval both semesters. Similarly, course credit was suggested as a form of compensation. In the Spring 2009 semester, two other suggestions were received favorably: “Count as field work in education courses,” and “Free Metrocards with fare.”

Table 6. Suggestions for Alternative Forms of Compensation for Peer Leaders

Suggestions for Compensation		
	Fall 2008 (N=39)	Spring 2009 (N=33)
Service to college on transcript	28	25
Credit	27	21
Recommendation letter	3	3
Research	1	-
Count as field work in education courses	1	26
Free Metrocards with fare	1	28
Grade for workshop	1	-
Scholarships and stipends	1	-
Certificate	-	1
Stipend	-	1
Priority registration	-	1
Uplifted spirit	-	1

Besides leading a workshop session, Peer Leaders were expected to attend a weekly preparatory session so that there would be in alignment with the lecture content and the problems presented in workshop. The faculty, liaison, and Peer Leaders were scheduled to meet for an hour to review problems and discuss issues that came up in their workshops. Table 7 shows feedback on the areas of support that the “Prep” session provided.

Table 7. Support Provided by Workshop Prep for Peer Leaders

What support did Workshop prep provide to you? (More than one response provided by respondents)			
	Fall 2008		Spring 2009
Communication with professor: emphasis, guidelines, updates	14	Helped by informing us what we should focus on	22
Problem-solving specific to the upcoming workshop	12	[Training Class]gave forms for leading workshop-increased insight into forms of learning	6
Prep generally helped	8	Helped me set up a lesson plan each week	5
Peers help answer questions	5	Keep up to date with lecture and help synchronize workshop with lecture	3
Helped remember concepts	4	Confidence through preparation	2
Prep didn't help much	4	Communicate with professor to see how the students are doing	1
Address problems	3		
Confidence	2		
Get to know peers	1		
Preparing quizzes	1		

Some popular suggestions for improvements for the “Prep” session include a change of day to avoid conflicts with other obligations and faculty should be more involved, including coming on time to these sessions (Table 8).

Table 8. Suggestions to Improve Workshop Prep

What suggestions do you have to improve Workshop prep?			
	Fall 2008		Spring 2009
Prep schedule conflicted with other tasks (club hours)	10	Be (held) on Tuesdays	9
Profs to be (more) involved	8	Every workshop leader and professor should come on time	3
Shorter	3	To review some topics	1
More leaders need to show up	3	Make rules for leaders to show up	1
Organization of material	2	Go over some of the workshop problems	1
Work more examples	2	Make it even clearer that we are not lecturers	1
More conceptual	1	N/A	6
Professors need to understand the point of workshop	1		
More efficiency	2		
N/A	7		

Finding space where a workshop group can work is sometimes difficult: classrooms are shared, laboratories are used – with groups meeting between the fixed “benches” and certain spaces are difficult such as lecture halls with fixed seating (Table 9).

Table 9. Comments on Physical Space for Workshop

Did you have any problem with the physical space for your workshop?			
	Fall 2008		Spring 2009
My room is fine	19	The space is adequate	9
Room unsuitable for PLTL	9	We had 3 workshops in one room, and 4 on last day	9
Room too small	6	Noise	6
Need separate rooms (space, noise)	5	Lecture room can't do group work	3
		It's a lab, not enough room to move around and making groups	2
		Other responses	5

Peer Leaders provided several answers to what motivated them to serve in this role. In Table 10, the top three main reasons for working as a Peer Leader are wanting: 1) to help other students, 2) to refresh their knowledge of chemistry, and 3) to gain leadership skills.

Table 10. Primary Motivation for Serving as a Workshop Leader

What is your primary motivation in service as a workshop leader? (Multiple responses)			
	Fall 2008		Spring 2009
Gratification/helping other students	23	Refresh memory on Chemistry	8
Gain experience/leadership skills	9	I appreciate Chemistry and want to share my enthusiasm with other students	6
Keeping up on Chemistry	7	Gain experience to lead a group of students	4
The money	5	Helping peers	4
I remember how much workshop helped me	3	Seeing the students have fun and learning	3
Interaction w/ students	2		
Resume	1		
Challenge myself!	1		

The responses presented in Table 11 regarding perceived benefits of being a Peer Leader are similar to the motivations (Table 10), although the emphases shift to some extent.

Table 11. Benefit of Serving as a Peer Leader

What is the most useful benefit to you of being a peer leader?			
	Fall 2008		Spring 2009
Gain experience/leadership skills	21	Refresh my knowledge of Chemistry	16
Keeping up on Chemistry	10	Act in leadership role	5
Gratification/helping other students	7	Communication and expressing thought clearly	3
Interaction w/ students	4	The experience, fun	3
Resume	4	Ability to help others enjoy solving problems	2
I remember how much workshop helped me	3	Gaining confidence	2
The money	3		
Get to know professor	1		
Learn about learning	1		

Peer Leaders are the “frontline” in aiding students to learn course material. From their perspective, suggested improvements to the PLTL program are as follows: more space and time, more participation by faculty in prep sessions, and better understanding by the faculty of Peer Leaders’ roles and the function of workshop (Table 12).

Table 12. Improvements to the PLTL Program

What should be improved about the PLTL workshop program?			
	Fall 2008		Spring 2009
Better rooms/more space	5	Each workshop can have own room	5
Chemistry II needs more time	4	Professors should attend prep	2
Professors should understand workshop	3	Prep at another time	2
Expand courses PLTL is involved in	3	It's perfect!	1
More participation by instructors	2	Nothing	12
Required attendance	2		
Smaller workshop size	2		
Scheduling	1		
Clearer communication	1		
Paid on time	1		
Each professor should work under same guidelines	1		

Responses to the next five exploratory questions (Tables 13-17) were solicited from the Spring 2009 survey. Peer Leaders were asked their opinions on how best to expand the PLTL program. Although Peer Leaders were introduced to various techniques in their initial training, they often resort to using one or two techniques in subsequent semesters that were comfortable for them. This limited repertoire may not be beneficial to all the students in their workshop group. Table 13 reports that while the majority was not in favor of having a refresher course (56%), a surprising 43% were willing to consider one.

Table 13. Exploratory Question: Refresher Training for Experienced Leaders (Spring 2009)

Should experienced leaders have a "refresher" course? (N=33) (Sample responses)		
Yes=13	No=17	No Response=3
Yes. PLTL education class taught me a lot	No. I don't think they will forget since they are active peer leaders The best training is experience	
But as a seminar	That would be annoying	

While the PLTL Workshop was embedded in the General Chemistry courses, that is, a mandatory component of the courses, students and Peer Leaders often commented that Workshop should be included in other courses, including Organic Chemistry, Physics, Mathematics (Calculus), Computer Science, and Engineering courses. If workshop were to be added, what training should experienced Peer Leaders (who already know how to facilitate a workshop group) undergo? The results, shown in Table 14, suggest that "Prep" – reviewing the necessary content on a weekly basis – would be sufficient (36%), perhaps with the introduction of techniques specific to that course's material (15%). However, 24% did not respond, and 24% (aggregated responses) did not think any specific activity would be necessary.

Table 14. Exploratory Question: Additional Training for Experienced Leaders in Courses besides General Chemistry (Spring 2009)

If workshop were in other courses what kind of additional training or prep should be considered? (N=33)	
Prep with problems/ refreshers on the material/ Supplement material from professors	12
N/A	8
Techniques to approach the different subjects	5
They should be students who take those courses	2
Why would extra training be required?	2
It is only necessary that the peer leaders have a good grasp of the materials	2
An A in the course is suitable. Maybe a quiz	2

If first-time Peer Leaders were considered as apprentices, mentored by more experienced leaders, should compensation be the same as for experienced Peer Leaders? The suggestion of an additional apprenticeship component in the existing PLTL program's structure evoked a surprisingly negative response (Table 15) in that 39% suggested no compensation, 42% suggested non-monetary compensation (aggregated), and only 12% thought that compensation should be the same for all Peer Leaders. There were two comments that provided juxtaposition of views about the concept of apprenticeship.

Table 15. Exploratory Question: Using an "Apprenticeship" Model for New Leaders: Compensation (Spring 2009)

If new leaders were considered "apprentices" what should their compensation be? (N=33)	
Nothing	13
Certificate or recognition (by Department Chair)/ recommendation letter/ prize such as coupon for books/ service credit/ scholarship	9
Early registration	3
Not have to pay for education course (1 credit)	2
Same as us (\$500/semester)/ money	4
Apprentices, in terms of Middle Ages guides, gain experience and wisdom to become journeymen. Leaders get rewards by learning from the experience. That is worth more than money.	1
An apprentice approach at a university makes no sense and is very unfair	1

In order to make the PLTL program more visible and attractive for Peer Leaders, the idea of a "certification program" that would include research credit and notation on transcripts was proposed. The results, shown in Table 16, are in response to the following question: "If there were a four-semester 'certification program' which included research and would be credited on your transcript, would you consider this as a valuable addition to serving as a Peer Leader? What should be included as its elements?" There was considerable support for this proposal: 75% agreed that there would be value for various reasons while 24% did not support the idea (including those who did not respond).

Table 16. Exploratory Question: "Certification Program" (Spring 2009)

If there were a four-semester "certification program" which included research and would be credited on your transcript, would you consider this as a valuable addition to serving as a Peer Leader? What should be included as its elements? (N=33)	
Yes=25	No=6
Yes, for being a workshop leader every semester, and doing 3 different courses.	No. This is the only job I do to earn money to buy my books and more, so I need money.
Yes, because it gives experience with working with students.	
Yes, absolutely!!! As many elements as possible.	Not Applicable=2
Yes, it is valuable because workshop leader spend time on it. It can be considered as "minor."	
Yes. This would be good experiences for any major. Good on resume.	

What did the Peer Leaders suggest as ways to expand the PLTL program? Communicating the benefits of workshop through data, advertisements, and contact with chairs, faculty, and students were some suggestions offered.

Table 17. Exploratory Question: Suggestions for the Expansion of the PLTL Program (Spring 2009)

What suggestions do you have on the best way to expand the PLTL program? (N=33)	
Solving problems in workshop in groups would be a great benefit to many students /(variations of statements of support)	8
Provide data to show the effect of PLTL	5
Meet with professors in other courses and explain what PLTL is and how the program can be tailored to help students in that course/ Let professor shadow other workshops	4
Post up flyers/ more advertisement/ post applications on walk	3
Contact the chair of department	2
Tell the students who are taking those classes to ask for it	1
Turn tutoring into workshop	1
Design workshops that cater to the needs and difficulties in the course	1
N/A	8

Conclusions

Peer Leaders are the heartbeat of the PLTL instructional model. They create, mold, and fashion the PLTL program. This study showed Peer Leaders were genuinely interested in helping their peers learn while they themselves strengthen their own Chemistry knowledge and leadership skills. Their dedication was even extended to their willingness to volunteer their services if some intrinsic reward system such as service credit was recorded on their transcripts.

To improve any PLTL program, feedback from Peer Leaders is necessary and beneficial. Their experiences, ideas, and honest critiques will assist in shaping the program to meet its

ultimate goal: To ensure all students are engaged in their learning process through an active community setting.

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Appendix A

Survey of Peer Leaders

[Developed by A.E. Dreyfuss, 2008, 2009]

(Please use a portion of the back for additional comments - number which question you are adding to)

- a. Professor(s) you work with this semester: _____
 - b. First semester in which you were a peer leader: _____
 - c. How many semesters have you served as a peer leader? _____
 - d. How many workshops are you leading? _____ Are you a coordinator? ___ Yes
___ No
 - e. What is your major? _____
-
1. What support has Workshop Prep provided to you in preparing you for Workshop?
 2. What suggestions do you have to improve Workshop Prep?
 3. What problems do you have with the physical space for your workshop?
 4. What is your primary motivation in serving as a workshop leader?
 5. Would you serve as a peer leader if:
 - a. You were not paid? ___ Yes ___ No
 - b. You were paid less than \$500/semester? ___ Yes ___ No
 - c. What would be the lowest amount you would consider? \$ _____
 - d. Would other forms of compensation be of interest?
 - i. Such as: Service to the college (on transcript) ___ Yes ___ No
 - ii. Credit: ___ Yes ___ No
 - iii. Other? _____
 6. What is the most useful benefit to you of being a peer leader?
 7. What should be improved about the PLTL workshop program?
 8. What is an appropriate amount of time for Orientation before the start of the semester?
 9. If new leaders were considered "apprentices" what should their compensation be?
 10. If experienced leaders served in other courses besides General Chemistry, what kind of additional training or preparation should be required?
 11. What would be the best way to expand the Peer-Led Team Learning Program into other courses? Other disciplines?
 12. Would you like to be a Peer Leader again? If so, please complete the Experienced Peer Leader form.

THANK YOU FOR YOUR CONTRIBUTION!