

PEER-LED TEAM LEARNING EVALUATION

PEER-LED TEAM LEARNING: EVALUATION, DISSEMINATION AND INSTITUTIONALIZATION

LEO GAFNEY

Why do faculty members adopt PLTL? The reason that emerges through faculty interviews and discussions is that lectures, homework, and testing are no longer enough to promote learning in the STEM disciplines. Perhaps they never really were enough to promote lasting learning for many students, but new understandings and increased interest in pedagogy have led to new STEM initiatives. There are several reasons why the traditional approaches are not working very well:

- STEM areas have become more conceptual and more quantitative.
- More under-prepared students are going to college and majoring in STEM areas. This may be simply because more students are going to college in general; or it may be that the secondary education in some places is not an adequate preparation for college; or as noted in the first item above, it may be that the increased complexity of science is making it more difficult for students.
- It is important to foster teamwork in learning and in problem solving. Teamwork is a fact of life in business, industry, research, and public life. So increased efforts are needed to introduce students to the process needed by a productive team.
- There is a desire to improve communications skills among students. In the past the various oral and written communications were left to the humanities courses. But now due in part to the emergence of applied science in public life in areas such as health, the environment, and energy, science instructors believe they should help students develop the kinds of communications skills they will need to take an intelligent part in discussion and debate.
- There is a need for structured homework time. It is reported that students are not putting in the study time needed for productive learning

Over the years the evaluations has been collaborative and multidimensional. Outside evaluators on grants, faculty members, learning specialists, administrators, and researchers have played role in collecting analyzing data. Independent evaluators have generally started by looking at implementation. For PLTL we used a simple model proposed by Wholey (1994) that considers resources, activities and outcomes. Resources include the expertise and experience of faculty members, the skills of student leaders, the abilities and background of students, and all that the institution has to offer. Activities include the workshops themselves, the development of appropriate materials, the training of leaders, and more. And there are a variety of outcomes including benefits for students and leaders, lessons in implementation, and the findings of different disciplines.

Peer-Led Team Learning – Evaluation: Peer-Led Team Learning: Evaluation, Dissemination and Institutionalization.
Leo Gafney – 2012, www.pltlis.org

Critical Components

The first and perhaps most important responsibility of an independent evaluator is the study of implementation. The evaluator looks at the activities, how they are structured, what procedures are used, what roles are assigned and accepted, and the changes that are needed. In evaluating PLTL we asked these and other questions, and through frequent discussion with the practitioners developed a model that has effectively defined the method, made subsequent evaluations easier, and provided a blueprint for dissemination of the method. The six critical components are as follows.

- **Integration with the Course.** Students who are in a workshop program are expected to attend all of the workshops. These are not drop-in sessions. Students should experience the workshops as closely coordinated with lecture and homework, and contributing to their success in the course.
- **Involvement of Instructor.** Ongoing involvement of the faculty member keeps the leaders involved and provides a necessary ongoing course connection.
- **Training of Leaders.** Leaders are the all important ingredient in establishing successful workshops. Selecting, training and supervising good leaders is the key in shaping the workshop dynamics and quality.
- **Appropriate Materials.** Materials are developed or adapted with the purpose developing skills, promoting problem solving, working well with groups, and reviewing topics recently taught.
- **Organizational Arrangements.** The workshops are intended for small groups of six to eight students, with adequate space and materials for group work and discussion. Two hours is the recommended time, but programs use the amount of time that is available.
- **Departmental and Institutional Support:** Resources and recognition are essential if the workshops are to continue.

Site visits with observations, focus groups, interviews, and surveys revealed that whenever PLTL was struggling with implementation, not finding success, and not really valued by faculty and students, problems could be identified in one or more of the critical components. In workshops of 50 or 60 minutes, students did not proceed deeply enough into team problem solving. If the workshop materials were not connected to the skills needed on tests, students would lose interest. And of course, if leaders were not well prepared for each workshop, the whole process would falter.

Student Engagement

An important activity in the evaluation of PLTL, as in many projects, is the assessment of student growth in interest, motivation, and involvement in the course. In some cases, faculty members consider student response in this area to be something of a frill: It's nice if students feel good about a project of course but the real test is in their learning, and this is assessed through tests and success is indicated in grades.

In fact a good case can be made for arguing in the opposite direction. Isn't it really motivation, interest, and involvement that drive the real scientist forward? Discoveries are often not the result of academic achievement but of imagination in crossing disciplines or taking new perspectives with the data. So if students report that PLTL makes them more interested and involved in science we should consider this a major accomplishment. In fact this is what has happened. Surveys, focus groups, and interviews provide ample data that through the workshops students become more engaged and excited about science.

Student Performance

But performance is not to be neglected. From the start of the project faculty implementers wanted evidence that using workshops would improve students' performance, measured by grades. More than 20 studies comparing cohorts of students with and without workshops, demonstrate that workshop students perform higher than non-PLTL students in percentages of ABC grades as a percentage of total initial enrollment. The difference on average was 10 to 15 percentage points. The statistics sometimes compared historical averages with PLTL classes or current classes for which some students were doing workshops and some were not.

Questions have arisen about the rigor of the studies. Are the studies devised with all the controls necessary to make them valid? An analysis by Chen (2005) is useful in this regard. He distinguishes between what he calls efficacy and effectiveness evaluation. Efficacy evaluation is characterized by very careful controls regarding the intervention and the two groups. The model for efficacy evaluation would be clinical trials for drugs or therapies. Social interventions and educational projects can be evaluated using the efficacy method. The approach tries to simulate a lab situation.

Chen describes effectiveness evaluation as taking place "in the real world." The method, in this case PLTL, is implemented with as much care as possible, employing the six critical components. The intervention group and control group are constructed to assure that they are fundamentally similar—based on whatever academic measures are available.

Chen points out and gives examples of studies that have demonstrated success in efficacy study but not in an effectiveness study, which is what really counts. Thus, based on this analysis, we can say that the comparison methods employed by the PLTL practitioners to verify academic benefits are not second best. They are in fact real-world studies. Each study tends to convince the practitioner at that site, and the mounting number of studies increase the evidence in general.

Benefits to Student Leaders

From the beginnings of PLTL, faculty members universally saw that the program was beneficial to the student leaders, and the leaders themselves responded to surveys, interviews, and focus groups saying that leading the workshops provided a number of benefits.

In 2002, after the workshops had been functioning for a number of years, a national online survey of former leaders was conducted. Responses to this survey were tabulated and analyzed and later published (Gafney & Varma-Nelson, 2007). The following were the major outcomes that derived from the study.

Learning: Content and Process

- Reinforced concepts and skills. The leaders, both with high percentage levels of agreement and in written comments, attested to the fact that guiding students in workshops was a big help in reviewing

the skills and concepts of the course. Leaders for general chemistry said the review was useful in their study of organic chemistry. Leaders in organic chemistry said that the review was important as they prepared for the MCAT exams or GRE's.

I truly believe that teaching someone else what I have learned recently is the best way for me to solidify my own understanding of a subject and improve both the integration of new knowledge with older knowledge and retrieval of information. As a workshop leader I developed the skills necessary to learn independently through the production of lessons (which is what I do often now as a teaching assistant in graduate student) and to learn through discussions—it often amazed me how much I could learn from the students in my workshops.

- Appreciation of group work. Acting as leaders gave students a deeper understanding of teamwork. They had already participated in group explorations and problem solving, but as leaders they were able both to plan workshop activities with teamwork in mind and to look more objectively at how students benefit in working together.
- Experience with learning styles. There is a good deal of evidence (ref) that listening and reading have limited impact on learning, particularly learning that lasts. Interacting and helping other learn add substantially to one's own learning. The PLTL leaders witness this and benefit from it. Some become expert in the course by guiding student groups several times through the material.

It (acting as a workshop leader) gave me some patience in trying to find the different ways each person learns. I've found that useful in my work, in acknowledging that sometimes when people don't understand a concept, it's simply because they don't understand the way it's being presented to them. I try to be very clear on my expectations of my staff, and if I'm not, I just explain the concept from a different angle.

People Skills

- Confidence in presentation. Leaders report that directing workshops gave them confidence that transferred to other areas, particularly to their role in giving oral or poster presentations.
- Skill in group leadership. Leading workshops offers experience that is valuable in guiding other kinds of groups, including working teams and committees.

Being a workshop leader helped me to understand that everyone interacts differently with people. It is important to not necessarily change how people act, but to work with their current personality type and show them how they can contribute to the group. It also made me understand that there can be different ways to solve one problem, and to be open to other people's ideas.

- Grasp of group dynamics. Meta-cognition, the process through which students reflect on their learning, provides insights that can make learning more effective; and in a similar way as student leaders learn more about group processes they become more able to work effectively with these processes.

Academic and Career

- Role of discussion in research. Several of the PLTL founding group have pointed to the similarities between the workshop processes and the ways in which scientists interact in a research group, or in general in presenting their work to colleagues. In both cases there is discussion of the problem, assumptions, method, and outcomes. The level may be quite different, but PLTL students are learning to listen and to look for ideas that will help solve problems as they interact with peers.

- Interest in academia and teaching. A significant number of PLTL leaders have said that the experience of directing workshops has motivated them to pursue teaching at some level or as some part of their career.

I'm one of the few TAs I know that actually loves teaching! Being a workshop leader helped me to overcome the fear involved in leading a classroom and instead to focus on helping each student to get something out of each workshop/discussion/lecture.

Dissemination of PLTL

The Workshop Chemistry grant was followed by an NSF national dissemination grant intended to promote workshops in biology, physics, and mathematics, as well as chemistry. A four-stage model was adopted for dissemination.

1. Stimulating Interest. Faculty members who implemented PLTL and found that it achieved a variety of benefits from improved learning to team and presentation skills, told their colleagues about the method usually starting in the department. This word-of-mouth process then continued with colleagues throughout the institution and beyond. Publications and presentations often followed so that PLTL became known and recognized as an effective method and important force in college teaching and learning.
2. Creating Deeper Understanding. Those who wanted to consider implementing PLTL attended professional development workshops ranging in length from half-day to two and a half days. At these workshops practitioners explained all aspects of the PLTL model. In addition student leaders demonstrated and discussed implementation and the benefits of the project. Those considering implementation often followed these workshops by visiting sites that were using the method to see that it really can work.
3. Implementation. An institution moves into the third stage of dissemination with implementation of PLTL, at least as a pilot project—often with mentoring from established projects.
4. New Scholarship and Leadership. The final stage, completing the cycle, takes place when the practitioners become leaders, promoting PLTL and conducting research on the method.

Diffusion Stages

The term “diffusion” is used more often in connection with practices in health care and social service programs. The meaning of the word “diffusion” is very close to that of “dissemination” except that “diffusion” refers more to the ones adopting a new practice, while “dissemination” refers to the ones promoting. Everett Rogers (2003) proposes four diffusion stages that are helpful in analyzing the spread of PLTL.

The first stage is that of knowledge. Rogers considers three types of knowledge, answering three questions that are of interest to the potential adopter.

- What is the initiative? A PLTL program offers small group problem-solving workshops, guided by a student leader, integrated with a course.

- How does the initiative work? PLTL answers this question with the six critical component. Follow these closely and you are very likely to have a successful program.
- Why does the initiative work? This is an interesting question which would be answered by PLTL in various ways. Some would say simply that it provides more time, with direction, to master the material. Others would point to social learning theories, particularly as developed by Lev Vygotsky, and say that these theories explain the reasons why interaction in pairs and small groups is so necessary to learning. Other practitioners are not particularly interested in the “why” of PLTL.

The second stage explored by Rogers is that of persuasion. The potential adopter has to make a psychological investment in the initiative. We found that the most energetic adopters of PLTL were faculty members who had been looking for a change. There was a level of dissatisfaction with the teaching/learning strategies they were using. They believed that there were better methods and were actively searching. At the same time they wanted evidence that they were likely to succeed with PLTL.

The third stage is that of decision. Potential adopters, of PLTL or any initiative, must convince themselves that the project will work and serve the needs of this course, with these students at this institution. Finally, faculty members must believe that the implementation will be worth the effort. We have visited locations at which some faculty members said they had reviewed the project, thought it was worthwhile, but would take too much time from their research.

Attributes of an Innovation

Rogers also discusses attributes that potential adopters look for in an innovation. Of these, the following are of particular interest to PLTL.

1. Relative Advantage—better than what? Those who were serious about improving teaching and learning often looked at a number of possibilities such as Supplemental Instruction, POGIL, Conceptests, and a variety of computer-related instruction. PLTL had demonstrate that it answered needs better than these other approaches.
2. Compatibility—with other priorities. College science programs might be interested in raising standards generally, or introducing new lab strategies, or recruiting and supporting under-represented minority students, or encouraging undergraduate research, or simply increasing the number of science majors. In addressing these and other priorities, faculty and administrators will ask whether PLTL is likely to play a positive, negative, or neutral role in relation to other priorities. In addition, each faculty member introducing PLTL will have to trust the undergraduate leaders with a share of the teaching/learning responsibility.
3. Complexity—is it doable? Some potential adopters admitted that implementation was daunting with the need to organize space, materials, leader training and all the rest that is required.
4. Trialability—Is a pilot feasible? As in the case of complexity and compatibility, faculties had to ask themselves whether they could muster the resources, energy, and time to do at least a pilot project with PLTL.

The Workshop Project Associates Program

The PLTL dissemination grant helped faculty members address the issues described above with a program of mini-grants awarded under the WPA (Workshop Project Associates) program with funds from the dissemination grant. These grants were generally about \$5000 with an equal amount or real funding from the participating institutions.

We were very pleasantly surprised at the amount of planning and energy that applicant put into these applications and the implementation that followed. During three years, 81 WPA grants were awarded. These mini-grants provided a variety of benefits to the individuals, their institutions and the PLTL network, in particular:

- The funding permitted the implementation of pilot projects. Thus, peer-led team learning spread in institutions, disciplines and courses. The method with proven success in teaching and learning was able to expand at a very low cost.
- The matching-grant requirement insured institutional support. Department heads, deans, and other administrators bought into the project, noticed the activities, and very often looked at the results.
- Those implementing WPA grants made connections with the PLTL network. The new projects were not isolated. Rather, participants attended project conferences, visited sites that had experience with the project, and in general became part of the larger initiative.
- The new implementations provided new experiences and data. We continually found that PLTL was more adaptable and more complex than we had thought. Very often, new sites attempted new approaches, for example to the training and rewarding leaders, to adapting materials, and seeing ways of structuring workshops to accompany new courses.
- The pilots as planned led to the developing of new leadership. It was not long before new practitioners began presenting their findings within and beyond their institutions, wrote papers, and applied for further funding.

Indicators of Institutionalization

As part of the study of PLTL, we tried to identify indicators of institutionalization. At first we thought that fidelity to the model with its six critical components would go a long way toward institutionalization. We discovered however that this was an over simplification. Successful implementation is important and necessary but it is not enough to guarantee that the program will last. By analyzing the existing data we came developed the following list of indicators

1. Fidelity to the model: A necessary but not sufficient condition.
2. Funding and administrative support.
3. Perceived success: Needed at each new institution.
4. Fit with the institution's mission and practice: Interest in pedagogy, active learning, undergraduate partnerships.
5. Core group of dedicated faculty: One person cannot sustain PLTL.

These indicators need further investigation. There may be other factors that we have overlooked. In addition, more time and analysis is required to provide details about what each of these indicators means in practice. PLTL is well established but there are only a few sites at which its roots are deep. We look for continued study at all levels and in each discipline to enrich the project in its efforts to improve teaching and learning.

References

- Chen, H-T. (2005). *Practical program evaluation*. Thousand Oaks, CA: Sage.
- Gafney, L. & Varma-Nelson, P. (2007). Evaluating peer-led team learning: A study of long-term effects on former workshop peer leaders. *Journal of Chemical Education*, 84, 535-539.
- Gafney, L & Varma-Nelson, P. (2008). Peer-led team learning: Evaluation, dissemination, and institutionalization of a College-Level Initiative (Innovations in Science Education and Technology). Dordrecht, The Netherlands: Springer.
- Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). New York: Free Press.
- Wholey, J. S. (1994). Assessing the feasibility and likely usefulness of evaluation. In J. S. Wholey, H. P. Hatry, K. E. Newcomer (Eds.), *Handbook of practical program evaluation* (pp. 15-39). San Francisco: Jossey-Bass.

Editor's note: This article is based on a presentation at the PLTL conference at Morehouse College, Atlanta, GA (Nov. 13-14, 2009). Most of the material is taken from a recently published study, Gafney, L & Varma-Nelson, P. (2008). Peer-Led Team Learning: Evaluation, Dissemination and Institutionalization of a College Level Initiative. Springer. This paper reviews 15 years of evaluation activities with PLTL.

Cite This Article as: Gafney, L. (2012). Peer-Led Team Learning: Evaluation, dissemination and institutionalization. Peer-Led Team Learning: Evaluation. Online at <http://www.pltlis.org>. Originally published in *Progressions: The Peer-Led Team Learning Project Newsletter*, Volume 11, Number 1, Fall 2009.