Peer-Led Team Learning

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Abstract

This article describes the Peer-Led Team Learning (PLTL) model of instruction and the critical components for its successful implementation and dissemination. It speculates about the future of PLTL and reflects on the lessons learned by the PLTL coalition as it evolved from a small consortium to a national network of about 160 faculty, fourteen hundred peer leaders and over fifteen thousand students from several disciplines, institutions and states.

Peer-Led Team Learning Workshop Model

Recommendations to improve student learning are clear: integrate peer-to-peer interactions into the pedagogical design by including teamwork and emphasizing time on task (Astin 1993; Seymour and Hewitt 1997). It is a distinct challenge for urban universities to implement these recommendations. Urban universities tend to have a diverse student body of traditional students, returning students, and transfer students with varied academic backgrounds. Many are first-generation college students lacking role models and appropriate mentors. A large portion may hold full-time jobs and some are raising families. Moreover, English is a second language for many of these students. These factors contribute to high attrition rates in gateway math and science courses. The challenge to faculty is to keep good students engaged without leaving behind those who are less prepared. Feedback from industry indicates graduates lack adequate communication skills and experience with teamwork. Student concerns center around impersonal teaching methods, lack of mechanisms for smooth transition from high school to college or community college to university, and a general feeling of isolation that comes from not being part of a community of learners.

The frustrations of both faculty and students can, in part, be traced to the over-reliance on the lecture model of teaching in class, which is commonly used in undergraduate science courses, and the lack of structure for encouraging students to work together. Lectures have benefits, but they also have limitations related to lack of student involvement. One way of including peer-to-peer interactions into the structure of a course is through incorporation of Peer-Led Team Learning (PLTL) workshops to complement lecture (Varma-Nelson and Coppola 2004; Varma-Nelson, Cracolice, and Gosser 2004). PLTL links the use of a trained peer-leader with small group work and integrates these into the structure of the course. The PLTL model preserves the lecture and introduces a new structure, a weekly two-hour workshop, where six to eight students work as a team to solve carefully structured problems under the guidance of a peer leader. PLTL draws from the following four well-established areas of educational design and research: group learning, reciprocal teaching, educational theories attributed to Vygotsky, and studio instruction (Varma-Nelson and Coppola 2004). The

PLTL model provides the mechanism by which students can verbalize what they already know and discuss how that relates to the newly acquired information and ideas. This provides a unique opportunity for students to construct new conceptual understandings that are often omitted in standard curricula (Cracolice and Trautman 2001).

Peer leaders are central to the PLTL model. Undergraduate students who have recently completed the course, have done well, and demonstrate good communication and leadership skills are recruited to serve as peer leaders. To be successful in this role requires more than content knowledge; peers must be carefully trained for this leadership role. The role of the peer leader is to facilitate group work for a team of students whose collective goals are to master the course content and learn habits of thought necessary for success in the discipline. The peer leader is neither an "answer giver" nor a substitute lecturer, such as a graduate student in a recitation or discussion session.

Peer leaders set by example the idea of honoring and respecting active participation by all group members. They are responsible for helping students learn more effectively in group settings, complementing lecture-based methods that are commonly used by faculty members during the formal class meeting. With time, the peer leader begins to distribute leadership activities to other individuals. The leader helps students build enough trust and understanding to communicate openly with each other, challenge each other, debate and discuss issues without being intimidated. Once this community of learners is formed, feelings of isolation should be alleviated.

Peer leaders have expertise as recent successful learners of the subject matter, in that course, at that institution. Since peer leaders are likely to have similar backgrounds as students, they form effective intellectual and social role models (Rogers 2003) from which first-generation students may benefit. In addition, because they are familiar with and have succeeded in the institutional culture, peer leaders can help the students make a smooth transition from high school to college or help transfer students from community colleges adjust to the culture of the new institution.

Peer leaders can serve other important functions as well. They can serve as a bridge between faculty and students, helping the students understand the expectations and goals of the faculty for the course. Faculty, on the other hand, can learn about special needs and concerns of the student body from the leaders. A peer leader provides a built in feedback mechanism, improving communication for all.

The PLTL model of instruction is well suited to address the needs of students at urban universities. Workshops are an ideal place for students who come with various academic backgrounds to learn from each other. PLTL provides a good environment not only for students to understand science and communicate with each other in the language of the discipline, but also to learn and practice communication in English. For students who hold full-time jobs and/or are raising families, PLTL workshops help impose a rhythm on the course and provide a structured time for keeping up with homework and understanding the material covered in lecture.

Finally, PLTL models instruction in the classroom the way knowledge is constructed in research groups, where students are taught to do "real science" (Varma-Nelson and Coppola 2004). It is not remedial in nature and addresses the educational needs of both traditional and non-traditional students. The PLTL workshop model is a robust model of instruction that has been successfully introduced in both two- and four-year colleges, as well as in research universities (www.pltl.org). Although the model is most well developed for chemistry, PLTL has also been successfully implemented in biology, physics, mathematics, and computer science courses.

Outcomes

The results of the PLTL Workshop include improved retention and better grades for all categories of students – male, female, majority and minority, commuter or residential (Tein, Roth, and Kampmeier 2002; Varma-Nelson and Gosser 2005). In successful PLTL programs, students are more satisfied with their educational experience. The majority of students in PLTL workshop programs state on evaluations that they would recommend the workshop course to their peers (Gafney 2001).

PLTL workshops benefit peer leaders as well. For most students, serving as a peer leader is a transforming experience. All who serve in this capacity have the opportunity to develop team-building skills while gaining a deeper understanding of the content. In the words of one peer leader, "I am serving as a peer leader in three courses so I can review the material. This is a great way to review for the MCAT."

Peer leaders have commented in surveys that it wasn't until they served as leaders that they realized how many gaps they had in their own understanding of chemistry and that being peer leaders forced them to reflect on their own strengths and weaknesses as learners. They also learn that there are many reasonable ways to solve a problem, not just the one that they have constructed. Their relationship with faculty and the institution is also altered. They evolve from being recipients of instruction to being partners with faculty in the design of the instructional environment for their peers (Varma-Nelson and Coppola 2004).

With time, peer leaders become increasingly independent at performing the tasks of being peer leaders in workshops and often become interested in taking on other leadership roles or become interested in pursuing careers that involve teaching and research. Recent research findings (Gafney and Varma-Nelson 2002, forthcoming; Tenney and Houck 2004) point to the following gains when students take on the role as peer leaders:

- Increased content knowledge and better success in higher-level science courses.
- Increased confidence to pursue science-related careers.
- An appreciation for different learning styles.
- Improved "people skills" and collegial relationship with the course instructor.

Successfully Implementing PLTL

Over a decade of experience with the development, implementation and evaluation of the model and its dissemination result in the articulation of the following six components that are indispensable to successful introduction of PLTL workshops into courses (Gafney 2001).

Professors teaching the course are involved in the selection of materials, training and supervision of peer leaders, and they review the progress of workshops. The best results are obtained when students see tasks performed in the workshops as relevant to the overall goals of the course. For this reason, faculty who are lecturing in the classroom must be involved in the design of workshop and assessment materials, as well as the training of peer leaders. When faculty teaching the course do not stay involved in the development of the materials and training of peer leaders, positive gains generally seen when PLTL workshops are introduced in a course are not realized.

The workshop is integral to the course. Lecture allows the professor to provide the expert's view of the subject, convey enthusiasm for the topic, model ways of thinking and analyzing, and transmit content to a large number of students, and therefore, should not be replaced with PLTL workshops. Rather, workshops should be an addition to the lecture, sharing the same goals. The purpose of workshops is to process ideas and develop a deeper understanding of concepts introduced in lecture. Ideally, participation in workshops should be required as part of the course. The course goals and benefits of participation must be explained at the beginning of the course. When a new pedagogy is introduced, all stakeholders need to be educated about it.

Peer leaders are selected, trained and supervised to be skilled facilitators of group work. First-time implementers should recruit peer leaders from their existing classes. In subsequent semesters, recruitment of leaders will become easier, with existing leaders helping faculty recruit. The next task is to select a model for leader training that is best suited to the institution. Whichever model is selected, it must include discussions on pedagogy, content of the workshop and group dynamics. The selection process and training of leaders is described in detail in *Peer-Led Team Learning: A Guidebook* (Gosser 2001).

Evaluation data (Gafney 2001) show that leader training is not optional and faculty involvement in training is vital. Without training, leaders become "answer givers" instead of facilitators. When faculty are not involved and they rely on a TA or a senior peer leader to do the training in their absence, there is a disconnect between what is occurring in the lectures and the activities in the workshop.

Between facilitating workshops, attending training sessions, and reflective journal writing, a leader typically commits six hours per week to PLTL. It is recommended that leaders be compensated for their involvement in service hours, tuition waivers, credit, or cash. Compensation for the peer leaders should be scaled to whatever work

is the most appropriate comparison on campus (tutors, student aides, laboratory assistants). Other benefits, such as priority registration status, may be provided to the peer leaders as well.

It is neither beneficial to the leaders nor to the students for the peer leaders to work with the same faculty member and the same course repeatedly. The more experienced leaders should be encouraged to take on the role of a coordinator of leaders with responsibilities for recruiting and reading weekly journals and giving the leaders constructive feed back. They can also participate in training new leaders or other faculty, on campus as well as at other faculty development workshops outside their institution.

Workshop materials are appropriately challenging, relevant, directly related to material covered in lecture and designed for small group work. Materials should be "titrated" to students' abilities, course expectations, and institutional setting. Problems used to create workshop units should be difficult for most individuals to do alone, but not so challenging that a team cannot complete them successfully in a face-to-face setting. The best problems are the ones built around concepts that students have misconceptions about. The problems that students always have difficulty with on exams make good workshop problems. Primary literature is also a good source of thought-provoking problems.

Solutions to the workshop problems should not be provided for the students or the leaders because the focus in a workshop is on the process of finding and collectively evaluating answers and then arriving at a consensus. Confidence in the solution should come from debate and discussion just as it does in research, not from consulting an answer key.

Workshops are held once a week for two hours, contain six to eight students per group, in space suitable for small-group activities. A team of six to eight students and one peer leader provides a team large enough to ensure heterogeneity of ideas and diversity of intellectual abilities and resources without being so large as to prevent participation by all team members. In general, groups larger than six to eight are harder for a peer leader to manage and tend to take on characteristics of recitations, where individual participation can drop to negligible amounts and discussion can be taken over by dominant students (Michaelson, Knight, and Fink 2002; Sarquis et al. 2001). While two hours is the optimum length for a workshop and allows the group to engage in group activities, the project evaluations reveal that ninety minutes is also adequate.

PLTL is supported by the department and the institution with funds, course status and other support. Support from the department chair, senior faculty and dean of the school are essential for successful implementation of PLTL (Sarquis et al. 2001). Two types of support are necessary, financial and a faculty reward system that values good teaching. A detailed discussion surrounding institutionalization issues can be found in the PLTL Guidebook (Kampmeier, Varma-Nelson, and Wedegaertner 2001).

A Model for Disseminating PLTL

The goal of the PLTL project leaders in 1998 was to design a comprehensive plan to disseminate the PLTL model of instruction to undergraduate faculty teaching in mathematics and science disciplines. The dissemination model had to include the following features to be successful: (1) Faculty development designed according to good pedagogical principles; (2) A self-sustaining mechanism; (3) A method by which new adopters might go through the implementation process in less time than was needed by the original group; and, (4) Flexibility allowing for adaptation and local variation without undercutting the effectiveness of the model.

Dissemination of PLTL had to be treated as a scholarly activity, not just a marketing effort. The design had to be unique and built around the critical components for successful implementation of PLTL. Besides faculty, two other groups needed to be educated—the learning specialists and the administrators who are responsible for the budgetary and infrastructure needs of the program.

Further dissemination of PLTL required faculty and peer leaders forming partnerships. The perspective gained by peer leaders through their experiences as students in workshops, as well as facilitators, is unique and invaluable for the potential implementers. Peer leaders are both recipients of and contributors to this pedagogy. Their involvement in faculty development workshops allows faculty to experience the pedagogy, with faculty playing the role of the students rather than simply learning it in theory.

Keeping these factors in mind, a model of dissemination was designed (Varma-Nelson and Gosser 2005) around activities organized into the following categories:

- Stimulating broad interest in the PLTL model.
- Creating a deeper understanding of the PLTL model.
- Assisting adaptation and implementation of the PLTL model.
- Developing and nurturing an expanding leadership that, in part, would stimulate interest in others and feedback to the first stage.

Stimulating interest in the PLTL model. Activities included in this tier are presentations at national, regional, and local meetings; publication of a five-volume PLTL series by Prentice Hall; as well as publication of a project newsletter, articles in peer-reviewed journals, chapters in books about teaching and learning, and construction of a project Web site (www.pltl.org). The presentations and publications explain the model and stimulate interest and curiosity among those who are not familiar with the model.

Creating a deeper understanding. This tier of dissemination is for those who wish to learn more about the model with an interest in implementing PLTL workshops in their own courses. Activities consist mostly of workshops, which range in duration from three hours to three days. The content of the workshops is the same and designed to address the critical components for successful implementation of the PLTL model. However, the time devoted to each topic varies depending on the length of the workshop.

Most of the three-day workshops have been part of the NSF-funded Chautauqua Faculty Development Program. While participants in these workshops were mostly chemists at the beginning, recent participants have come from all science fields. For example, a workshop was presented at the University of Wisconsin, Madison for thirty-two members of a computer science national consortium, which is using the PLTL workshops to increase the number of female, minority and non-traditional students in their field. Another workshop was presented to about fifty faculty at Morehouse College where PLTL workshops are being introduced in all the science courses.

Assisting with implementation. At this level, dissemination includes support for faculty piloting PLTL workshops in their courses with financial assistance and mentoring from the PLTL national project. The Workshop Project Associates Grant (WPA) program provided up to $5000 per course per institution and a maximum of $10,000 per department per institution to assist faculty and learning specialists in developing and implementing a PLTL course at their institution.

The rationale for this program was to initiate institutionalization on the campus by requiring matching funds and establishing a link with the PLTL project through peer review and connection to mentors. As a result of these associations, the new implementer would not be isolated, but would become connected to a national network and have the support of an external coalition.

At the conclusion of their project, the WPAs are required to submit a report to our office. Preliminary data in the reports indicate that most of the WPA recipients had attended a Chautauqua course. Of the 234 attendees at the Chautauqua courses, seventy became WPAs. It is clear that the majority would not have implemented PLTL in their courses without the mini grants, for of the sixty-eight respondents, forty-eight said they would not have implemented PLTL in their courses if the WPA grants had not been available. Listed among the strengths of the PLTL model were: "higher grades and lower attrition," and "The ability to add an active learning component without changing everything else in the course," and "... a format which is both structured and flexible enough to be adopted." Some of the challenges identified with PLTL implementation were training of peer leaders, availability of workshop materials, funding, organizational arrangements and faculty involvement.

While most of the proposals received were of high quality, some were not. It was surprising to learn how many faculty were not familiar with the process of writing and administrating of grants. A few expected the review process to be less rigorous than it was and were not pleased to receive negative comments from the reviewers even though the comments were meant to be constructive. The applicants always have an opportunity to respond to the comments. Assistance was provided in every aspect possible through consultation with project faculty to help the applicant succeed in receiving the grants and implement the program effectively.

Developing new leadership. Each year since 1999 the PLTL project has hosted an annual leadership conference for new implementers to encourage interactions among

the initial implementers and the new adopters to create new leadership through planning and participation in project activities and to determine the future direction of the project. Many faculty other than the founding group have organized symposia on the PLTL model, presented posters, made oral presentations and presented workshops at the local, national, and international meetings. In addition, several have published papers in peer-reviewed journals.

Catalysts and Barriers for Disseminating and Institutionalizing PLTL

Forming a relationship with a publisher. Published PLTL materials have assisted the dissemination process. Prentice Hall has assisted dissemination by distributing complementary text copies. The Guidebook and the Handbook for peer leaders have been valuable for discussions at workshops and as materials participants can take with them for future reference. Those implementing PLTL workshops in disciplines other than chemistry have found it necessary to develop their own materials (Varma-Nelson and Gosser 2005). Some of these materials are posted on the PLTL project Web site.

Students. Students who have been in workshops have proven very effective in convincing other faculty to adopt PLTL in their courses. It has been our experience that faculty are more convinced by students' testimonies of the benefits of PLTL than their colleagues' testimonies.

Department Chairs. Department chairs and administrators can be effective in bringing about change. For example, a department chair brought the entire chemistry faculty in his department and a learning specialist to a Chautauqua course. This department has introduced PLTL in all chemistry courses. Some institutions have included PLTL courses in their first-year experiences.

Barriers to PLTL. Barriers to dissemination and institutionalization remain the availability of materials, proper training of peer leaders, funds to pay the leaders, and faculty involvement. Institutional culture and faculty reward system also play an important role in institutionalization as discussed earlier. Even when PLTL has been successfully implemented on some campuses it has failed to be institutionalized. Thus, increase in retention and better grades are not enough for adapting a new pedagogy. Factors determining whether PLTL will be institutionalized are complex and are still being evaluated.

Future of PLTL Project

Funding from NSF for the project is about to end. The PLTL Project has a national presence, however, it is unclear how deep are its roots. Many faculty at a variety of institutions and disciplines have incorporated PLTL into their courses successfully. Further dissemination of the model lies in the hands of current implementers. Without major funding, dissemination at the local and regional level is the only practical approach.

The decentralized project has a good chance of surviving because PLTL makes sense intuitively and is firmly based in research literature about how students learn. It is relatively easy to implement and it produces results. It does not need sophisticated technology to be successful but sophisticated technology can be used in a PLTL setting to do significantly complex projects. When done well, it has something for each of the stakeholders, better grades for students, better understanding of content for students and peer leaders, lower attrition rates and a leadership role for the good students.

New adopters will decide the fate of PLTL. How people incorporate PLTL into their courses will depend on the problem they are trying to address. PLTL has a sound theoretical background and can be used as a vehicle for deeper changes in a course or entire department. It provides a path for rethinking course content and pedagogy, the role of students, the relationship of students to the department, and students' role in the educational enterprise as a whole.

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