PEER-LED TEAM LEARNING
THE EXPERIENCE OF LEADING

PLTL IMPACTS A CAREER –
FROM PEER LEADER TO THE PROFESSORIATE

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In August of 1998, I arrived at the University of Rochester fresh from a five-year BS/MS at Virginia Tech. That fifth year to complete a master's thesis convinced me that I wanted to be a physical organic chemist, and also had me considering an academic career rather than the pharmaceutical industry trajectory I had always imagined. At Rochester I joined Joe Dinnocenzo's group to study photoinduced charge transfer initiated cation radical reactions in polymeric media, and I realized I would get to (or have to) teach for at least a semester or two. I had had some experience in a traditional organic lab as a Teaching Assistant (TA) in the fairly independent teaching environment offered at Virginia Tech while I was a master's candidate, and had also broken ground as one of the first cohort of undergraduate general chemistry recitation instructors at Virginia Tech (the faculty wanted recitations, but couldn't afford graduate TA's!). I figured this would be an easy and routine assignment in Rochester's more highly structured and less demanding teaching environment. After a semester or two in the honors organic labs (and serving as a grader and lecture assistant), coupled with the opportunity to mentor a talented NSF-REU undergraduate student from Miami University in the Dinnocenzo lab, I was sure I wanted an academic career. Moreover, I was now inclined to search for a career focused on undergraduate education through teaching and authentic research. But I was equally convinced I didn't want to TA another lab to build any more teaching experience.

Jack Kampmeier, who was still active in physical organic "supergroup" meetings, but had curtailed his own research by this time, was in his third year of implementing PLTL in organic chemistry (which until then had been solely a general chemistry pedagogy at other campuses). I was one of three grad students who vigorously petitioned Jack to allow us to participate as "peer leaders" in PLTL even though we weren't quite peers. Despite reservations about how we might be perceived more as "egg-headed experts" rather than as more normal and approachable "successful peers," Tina, Joe, and I all served one or more semesters as peer leaders, auditing the peer leader training course as well as facilitating our individual workshop groups. Soon we each moved into a variety of roles as "super leaders," or formal or informal facilitators of the peer leaders. Jack also broke with tradition and allowed a few of us grad students to serve as substitute lecturers for him when he was away – gaining us valuable experience, and his classes gained novice but eager, enthusiastic, and highly motivated guest lecturers.

Meanwhile my PhD supervisor, Joe Dinnocenzo, was very supportive of both PLTL and my own teaching interests and indulged me in this, despite perhaps his rather having me on a research assistantship eking out a few more hours in the laboratory. I also seized several opportunities to participate in PLTL regional and national dissemination activities. I was sold on the pedagogy and

wanted to share it with others. At the time I barely even considered dissemination for either the educational experience (how better to learn the model than to convey it to others) or the resume building opportunity that it was. Getting to both observe and participate in PLTL as it spread among subdisciplines and then beyond chemistry, in its relatively early stages, while research on the method was quite active, assessment was vigorous, learning specialist support was high, funding was readily available, and national dissemination was concerted, allowed me to learn much about the "scholarship of teaching" before that term came into vogue, while building practical experience for my own eventual implementation. I learned the importance of the PLTL "critical components" of integral incorporation into the course with expected attendance, faculty engagement, well-trained peer leaders successful with the content and expert with people, challenging problems appropriate to group setting and obviously relevant to the course and its exams, optimized arrangements of group size and setting and time, and a supportive infrastructure and administration.

It was also in dissemination that I began to network with the broader PLTL community. This included those on the fringes of PLTL, making their first tentative explorations of the pedagogy, some with skepticism, but many with wide-eyed enthusiasm. To some it was totally new, but others were just making tentative forays into implementation and these folks could share the successes and challenges and lessons learned the hard way with those who had yet to experience them. Even more vitally it was at this time that I began to network with the inner cohort of PLTL pioneers – names like Varma-Nelson and Gosser, Strozak and Cracolice, Gafney and Dreyfuss, and many more besides. Each one was an encouragement to me then and now – supportive of my own lofty aspirations, and displaying both pragmatism and idealism as educators who put their students' learning as foremost in all they did and do.

Moreover, all this experience with PLTL and understanding of constructivist pedagogy and active learning gave me something meaningful to say in the teaching philosophies I had to write when applying for faculty positions. I remain grateful to my postdoctoral mentor, Ned Porter at Vanderbilt, who allowed me time to carefully craft these applications during my short time in his lab as a postdoctoral trainee. During that year in Ned's lab, I sent out 18 applications, the first 16 of which yielded eight interviews and six offers, two at truly top-notch research intensive primarily undergraduate liberal arts colleges. Without my PLTL experiences I doubt I would have been nearly so competitive. These experiences, coupled with a decent research plan and the sage advice on pursuing faculty careers I had gleaned from Neil Jespersen's Academic Careers in Chemistry workshop at the Eastern Analytical Symposium, gave me a solid application package and meaningful things to discuss while interviewing.

Among several good offers, I chose Hope College as a place where I felt I could be successful in meaningful, fundable, publishable research with undergraduates while being supported in implementing PLTL in my own faculty career. Indeed the entire department seemed supportive, but fellow organic chemist Elizabeth Sanford was downright eager to jump in with both feet – apparently she had been waiting several years to have someone to partner with in implementing either PLTL or POGIL. So we quickly converted a weekly one-hour recitation that accompanied our thrice weekly hour-long organic lectures to a first approximation of PLTL, or at least "team learning." We held these Workshops in a room full of 8-place round tables with the entire class meeting in one room at one time in static groups of 6-9 students (engineered for diversity of gender and prior chemistry

grades) to work PLTL Workshop materials that we either wrote ourselves or adapted (or adopted directly) from the Prentice Hall workbooks and Jack's own workshop materials. In the first year we ourselves served as the lone roving peer leader in our own sections. By year two we added a roving undergraduate TA in the room with us, and by year three we were up to ourselves and two TAs for each section of *ca.* 5-7 groups of 6-10 students each, and all four organic faculty had embraced this implementation and it continued even in semesters in which I was not teaching the course.

And so it remained until 2010, when my third attempt at an NSF CAREER grant was funded. Full implementation of PLTL and concomitant assessment thereupon was one of three educational initiatives in what is otherwise a half million plus dollar grant to support my research into developing a family of organic photochromes into a new class of "switchable" photoinduced charge transfer initiators. So it is that in Fall 2010 we divided the 120 students in our two sections of organic chemistry into 12 groups, each group meeting for only an hour (less than ideal, but it is all that the College will support, and even that fourth hour in a 3-credit course is under attack), but with their own trained peer facilitator. We still use the large room full of round tables for up to four groups at a time, but offer the twelve groups over six different time slots. We have had very little problem in mixing groups across sections, as we use the same text and follow the same syllabus and course schedule. We have moved our fourth contact hour of teaching to the training of the facilitators (a term we prefer over "leaders," though PFTL doesn't quite have that ring to it!) in the theory of PLTL and constructivist active learning in general, in refreshing the material for that week, and in specific strategies for approaching both group dynamics issues and the chemistry problems themselves. Funding for this initiative will run through Spring 2015, at which time I suspect the Department and College will continue to fund the modest increase in TA budget (undergraduates are remarkably cost-effective!), presuming we can defend the ability to expect students in class for four hours per week in a three-credit course. I suspect that to do so we may lose that fourth contact hour teaching credit in our load calculations, certainly for all but one faculty member leading the peer facilitator training but perhaps altogether.

Jack, PratibhaVarma-Nelson, Leo Gafney, and others in the PLTL community have thoroughly convinced me that pedagogical improvement without dissemination is just as unfortunate as research without publication. So beyond sharing my own story here, I am actively engaged in sharing with the community of postdoctoral scholars who might wish to pursue academic careers in chemistry. Inspired by the American Chemical Society's "P2F" – Postdoc to Faculty – workshops, in which I had the opportunity to serve as a panelist in multiple sessions and lead presenter in a session on PLTL at the August 2010 P2F workshop in Boston preceding the fall national meeting, I have launched my own biennial Midwest "P3" – Postdoc to PUI Prof – Workshop as second educational component of my NSF CAREER award. While the ACS meetings are wonderful two-day workshops aimed at all academic careers in chemistry (much like Jespersen's ACC workshop that made such an impression on me), my own workshop is three days and specifically focuses on getting postdocs onto a research intensive primarily undergraduate institution (PUI) campus with panelists spanning a range of undergraduate institutions (from two-year colleges, state undergraduate and comprehensive universities, and liberal arts colleges with a range of research opportunities and expectations). The workshops (www.hope.edu/P3) are focused on preparing postdocs to understand PUIs, prepare successful applications, interview well, negotiate offers, and survive and thrive in their years as junior faculty. The workshops will include a day on specific pedagogies and initiatives at Hope (from PLTL

to clickers to early incorporation of computational modeling in the curriculum to interdisciplinary teaching and research initiatives in phage, neuroscience, bioinformatics, and computational science) that I hope will plant seeds for these participants to incorporate into their own teaching and research statements the way PLTL did for me.

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