



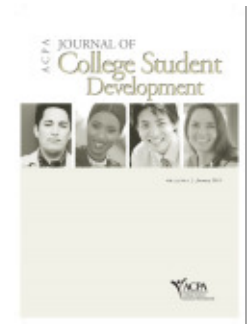
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Marina Micari, Amy Knife Gould, Louie Lainez

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Becoming a Leader Along the Way: Embedding Leadership Training Into a Large-Scale Peer-Learning Program in the STEM Disciplines

Marina Micari Amy Knife Gould Louie Lainez

Although many college students enter leadership programs with the express goal of developing leadership skills, some specialized leadership programs draw students who seek to gain expertise in a disciplinary area, with leadership development as a secondary goal. In the latter case, program developers face the challenge of generating enthusiasm among student participants for thinking and talking about leadership. This paper addresses the question of whether undergraduates can develop as leaders when that is not their explicit goal, chronicling the evolution of a program designed to do just that. Data collected through survey and interview research suggest that participating students do indeed develop as leaders in meaningful ways.

The development of college students as leaders has long been a goal of higher education (Boatman, 1999; Brungardt, 1997; Cress, Astin, Zimmerman-Oster, & Burkhardt, 2001), but recent years have brought more pressing calls for undergraduate training in leadership skills, and a growing number of leadership programs have emerged at institutions across the country (Astin & Astin, 2000; Council for the Advancement of Standards in Higher Education, 2006; Zimmerman-Oster, 2003).

Student leadership programs take many forms, from 1-day workshops to stand-alone extracurricular programs to full degree-granting programs. Most seek to train students as leaders in a generic sense (e.g.,

the DePaul University, Student Leadership Institute, the Northwestern University, Undergraduate Leadership Program, the Smith College LEAP program, and the Wesleyan College, Summer Leadership Institute), whereas others train students to act as leaders in some particular context (e.g., the American Medical Student Association's Primary Care Leadership Training Program, or the University of Montana/University of Idaho Natural Resources Public Interest Leadership Development Program). In the latter type, students are typically learning to perform as leaders in a field to which they feel committed; the motivation to participate in training stems from interest in the subject matter. In this sense, such programs may fulfill the especially important function of developing leaders who may not otherwise choose to engage in leadership development activities—so that students become leaders along the way to developing expertise in their chosen fields.

But such leadership programs also face a significant challenge: engaging students who may not have an interest in leadership development per se. This paper describes one such effort—a training course for peer leaders in science, technology, engineering, and mathematics (STEM) workshop program at a private research university—and addresses the effectiveness of the program by investigating participants' leadership development.

Marina Micari is Associate Director, Amy Knife Gould is Associate Program Coordinator, and Louie Lainez is Program Coordinator, each for the Searle Center for Teaching Excellence at Northwestern University.

The Gateway Science Workshop (GSW)

The students in our leadership training program are required to enroll as a component of their positions as peer facilitators in a peer-led STEM workshop program, known as the GSW program, at Northwestern University. This program is similar to many others run in institutions around the United States, including the large Peer-Led Team-Learning consortium (Gosser & Roth, 1998). In many of these programs, peer leaders receive training of some sort, ranging from individual workshops to formal academic courses (see, for example, National Education Association, 2003; Tien, Roth, & Kampmeier, 2004).

The GSW program runs workshops associated with courses in five STEM disciplines (Swarat, Drane, Smith, Light, & Pinto, 2004). Each group is led by an advanced undergraduate (the peer leader). Groups of 5 to 7 students, together with the peer leader, meet for 2 hours each week throughout the academic year to work on a set of conceptually challenging problems. These problem worksheets are written by a STEM faculty member, and peer leaders meet with this faculty member ahead of the weekly group meeting to ensure they have a strong grasp of the worksheet material. Although they are responsible for leading the groups, peer leaders take a “coaching” rather than a “teaching” approach to classroom leadership. They are instructed to guide students through problems and intervene only when necessary, encouraging students to seek and find answers on their own.

The GSW Peer Leader Profile

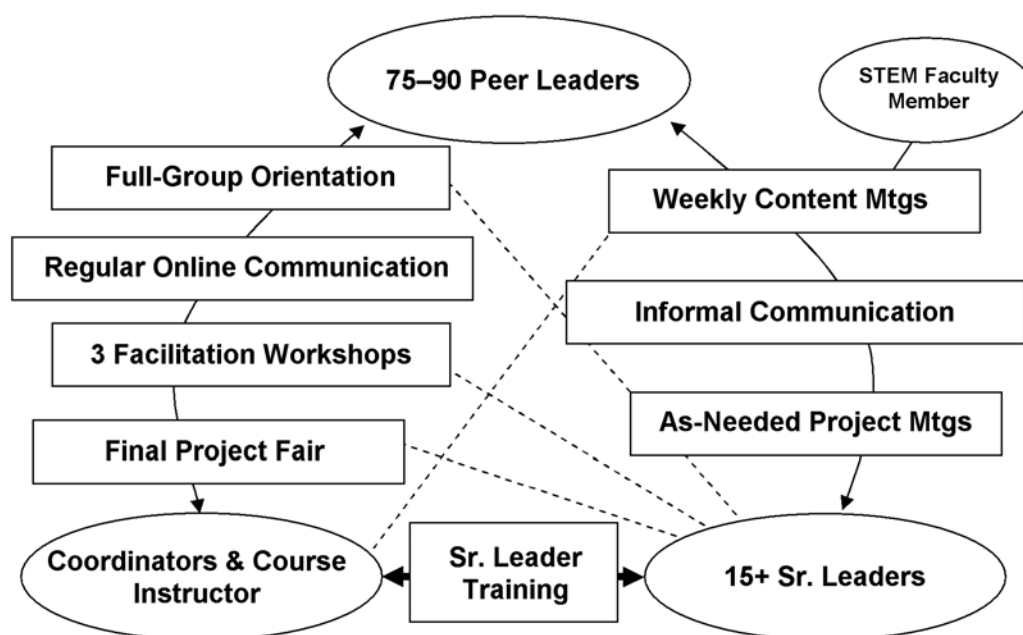
GSW peer leaders are typically junior or senior undergraduate students who have taken and done well in the course for which they facilitate a workshop. Most of the leaders in the program participate for one academic

year; some continue for a second or third year as senior leaders. We typically have more students apply to be peer leaders than we can accept, so we make hiring decisions based on recommendations of STEM faculty, performance in the STEM course, previous experience in teaching, tutoring, or mentoring, and interest in working with beginning undergraduate learners. At one time, peer leaders were paid \$400 per quarter, but now they receive course credit for the required training program in lieu of payment.

We regularly have approximately equal numbers of male and female peer leaders (and approximately equal numbers of male and female applicants), and most—around 70%—plan to attend medical school. An additional 20% or so typically plan to attend graduate school in a STEM discipline, with the others planning to work, volunteer, or attend graduate school in another subject.

The GSW Peer Leader Training Course

Although our peer leaders are well qualified academically, we recognize that they have not yet had the opportunity to develop the learning facilitation and general leadership skills that are critical to the success of the GSW program. Our training course is designed to help them develop these skills. The course is taught by a staff member at the university’s teaching and learning center and supported by program staff and 15–20 senior peer leaders, who are paid veteran peer leaders. The course is spread over an entire academic year, but carries the same amount of credit as a typical single-term course. It is required for peer leaders in the GSW program, and approximately 80 peer leaders enroll each year. We have only two full-group meetings: a full-day orientation at the beginning of the year and a spring “poster fair,” in which small groups present the projects they have worked on throughout the year. Peer



The training course involves three sets of people: the peer leaders, who are the students, the course instructor and program coordinators, and the senior peer leaders. The staff trains senior leaders, who meet weekly with peer leaders, communicate with them regularly in person and through email, and meet on an ad-hoc basis to manage group projects. The peer leaders are in regular communication with program staff through email, and they meet with program staff at a beginning-of-year orientation, at facilitation workshops three times a year, and at a final group project poster fair. Program coordinators also attend some weekly STEM content-training meetings, led by the STEM faculty member and facilitated by senior peer leaders.

FIGURE 1. Training Course Structure

leaders also meet in smaller groups (of 15 to 20 students) three times a year for training workshops, in which they explore particular facilitation issues (e.g., collaborative learning, active learning, problem-based learning). In conjunction with the leadership training course, peer leaders meet weekly with STEM faculty to review the week's problem sheets. See Figure 1 for a depiction of the course structure.

Our training course is designed to help students become more effective peer facilitators over the year they are engaged in this practice.

More specifically, we have five key objectives for the course: for students to (a) become familiar with, and critically reflect on, pedagogical theory and research; (b) gain knowledge of the dynamics of small groups; (c) gain practical facilitation skills; (d) reflect on practice and self-evaluation skills; and (e) begin to think critically about leadership and learning by engaging in systematic evaluation of their own practice. We describe our efforts in each of these areas below, and they are summarized in Table 1.

Become Familiar with Pedagogical Theory

and Research. To serve as effective leaders, our students need to have some understanding of how learning happens best, particularly in the STEM fields. As Shulman (1987) has noted, effective teachers need not just content knowledge but also “pedagogical content knowledge” (p. 125) or an understanding of how people learn best in the particular discipline. Therefore, we ask facilitators to read articles on cognitive processing and conceptual change in the context of STEM courses, as well as more general readings on educational psychology, including such topics as motivation and self-efficacy. To help ensure that they engage with these readings, we ask students to write short reflection papers responding to the authors’ ideas and describing how they feel these ideas relate to their practice as peer leaders.

Gain Knowledge of Small-Group Dynamics. Through informal conversations and by reading their reflection papers, we have seen that our peer leaders focus almost exclusively on how to help students learn the content of

their weekly worksheets, often ignoring the importance of managing group dynamics—which is critical to effective group functioning (Armstrong, 2004; Astin & Astin, 2000; Brookfield & Preskill, 1999; Komives et al., 2006). To help fill this gap, we have our peer leaders read articles on small-group interaction and development, and again write short papers reflecting on these readings. Moreover, through their engagement with senior peer leaders in weekly group meetings, our peer leaders have group management modeled for them on a regular basis. (We work separately with the senior peer leaders to effectively model group management in these meetings.)

Gain Practical Facilitation Skills. All of this work on theory and research would be of little practical value to our peer leaders if it were not situated in a practical experience. In addition to assigning short readings that offer advice on managing a peer workshop group, we expect peer leaders to link all of the literature they read to their practical experience, and we encourage both formal and informal

TABLE 1.
Learning Objectives

Goal	Activities
1. Become familiar with, and critically reflect on, pedagogical theory and research	Readings on learning in STEM disciplines; reflection papers linking readings to practice; discussion
2. Gain knowledge of the dynamics of small groups	Readings on small-group interaction and development as well as diversity; reflection papers linking readings to practice; discussion; engage with a sr. facilitator–mentor
3. Gain practical facilitation skills	Readings on facilitating small groups; regular opportunity to ask questions and give & receive advice
4. Develop inquiry skills by engaging in research on practice	Group research project in which students investigate a question related to small-group learning in STEM disciplines
5. Reflect on practice and self-evaluation skills	Regular discussion of practice; observation and student evaluation twice yearly, with reflection papers

conversation about practice throughout the year. Senior peer leaders serve as sounding boards and coaches for peer leaders, talking weekly with them about issues arising in the workshops. Peer leaders also discuss practical concerns when they come together several times a year for training sessions.

Develop Inquiry Skills by Engaging In Research on Practice. As the Boyer Commission report noted a decade ago, U.S. universities have an obligation to involve undergraduates as junior scholars in generating new knowledge in their fields (Boyer Commission on Educating Undergraduates in the Research University, 1998), and the call is just as clear today (Board of Directors, Association of American Colleges and Universities, 2006). We engage peer leaders in research through a collaborative project in which they investigate some question related to small-group learning in the STEM disciplines. Working in small groups, students identify a problem and research question, collect and analyze data, and present findings at a public poster session. This exercise not only helps students learn the process of research in education, but it also prompts them to think more critically about how learning happens within the context of the GSW program, and beyond.

Reflect on Practice and Gain Self-Evaluation Skills. Because reflection on practice is critical to developing as a leader (Densten & Gray, 2001; Kouzes & Posner, 2006), we ask peer leaders to reflect continuously on their experiences in the weekly workshops. This reflection happens both formally, in assigned work, and informally, through ad hoc conversations. In addition to reflecting on how the theory and research they are encountering may relate to their own practice, peer leaders receive outside feedback twice a year, both from their students and from a fellow peer leader who observes them. In response to this feedback, peer leaders write short papers discussing why they believe

they received the feedback they did, and what changes they hope to make as a result.

PROGRAM OUTCOMES

In this section we describe some of the outcome data we have collected on the peer leaders' program experience over the past 7 years. We describe two separate studies here, a qualitative study that sought to elucidate the ways in which facilitators believed they had developed, and a survey-based study designed to gauge change in the peer leaders' perceived leadership skills over the course of the year-long program.

The first is a large qualitative study we conducted over the 2002–2003 academic year (Micari, Streitwieser, & Light, 2005) in which we collected 168 open-ended surveys (out of 188 sent) from facilitators, conducted 13 focus groups (3–5 per academic quarter) of five to seven facilitators each, and conducted in-depth interviews with eight facilitators. Survey questions covered five general areas of facilitator experience: academic, teaching, social, career-related, and personal. Focus-group questions addressed facilitators' overall impressions of the program and their facilitation experiences; their relationships with students, other facilitators, and faculty; their reactions to the conceptual problems used in the workshops; and their feelings about the training they had received. Focus groups lasted approximately an hour each. Individual interviews addressed facilitators' academic, teaching, social, career-related, and personal experience. The interviews lasted approximately 45 minutes each.

With the qualitative data, we used the thematic-analysis technique described by van den Hoonaard (1997) to search for salient points of common experience, as follows. First, we identified quotes capturing an important category of meaning. Second, we highlighted quotes that appeared to describe the same

essential ideas and grouped them into a single tentative thematic category. Third, we combined several tentative categories describing specific but similar experiences to create more comprehensive thematic categories. Fourth, we created subcategories, so that one theme subsumed another when there was overlap in meaning. Fifth, we checked thematic categories to ensure that all quotes contained within them fit their assigned categories.

The second study we will refer to was a survey-based pre- and post-program study designed to measure change in peer leaders' perceived leadership abilities. Over two academic years, we surveyed 166 peer leaders (with 100% participation), in two cohorts, during 2005–2006 and 2006–2007, once at the beginning of the academic year and once at the end. The survey consisted of 22 scaled items. The first 16 items asked facilitators to rate themselves on their ability to manage various aspects of the peer leader job as well as interests and post-graduation plans, with the scale ranging from 0 (*no ability*) to 6 (*excellent ability*). The last six items asked peer leaders peer leaders (at the end of the year only) to judge how much they felt they had improved over the year in terms more directly related to our course goals and activities: understanding how a small-group learning experience works, recognizing differences among students' learning approaches, being able to adjust for students with different approaches, understanding group dynamics, identifying aspects of diversity that influence group processes, and being able to help students change how they think about course concepts. These items were also scaled 0 to 6, 0 being *strongly disagree* and 6 *strongly agree*.

FINDINGS

In the large qualitative study (Micari, Streitwieser, & Light, 2005) we found that peer leaders clearly felt that their own cognitive

skills had improved, that they felt better equipped to interact with others in a variety of ways as a result of their participation, and that they perceived the experience as having a concrete impact on their professional futures. One facilitator explained, "When you teach, concepts come together because you are drawing, trying to draw connections in order to make it easier for the students to understand, and when that happens, you start understanding it better." Another told us, "[Facilitating] definitely trained me, and also made me realize that I can handle being in groups, speak to them, and get ideas across." And another said,

I thought it was really nice because it helps us get our feet wet into the world of academia, sort of. Even if it's just a little bit, teaching students, relating to them. It's much more than just knowing the material.

From the pre- and post-program survey study, we have evidence that peer leaders gain confidence and perceived ability in several key leadership areas. As shown in Table 2, we found that facilitators rated themselves more highly in spring than in fall in terms of their ability to

- keep the groups satisfied, motivate students, and generally manage group meetings well;
- manage a group in which one student dominates;
- solve problems that may emerge in the group, and solve interpersonal conflicts;
- explain complex ideas from the STEM course, and help students work through problems; and
- adjust the workshop when things don't go as planned.

Mean scores on the last six survey items, assessing perceived improvement at the end of

Table 2.
Peer Leader Pre–Post Survey Data

Survey Item Measuring Perceived Ability	Mean Perceived Ability Pretest Score ^a	Mean Perceived Ability Posttest Score ^a	Mean Difference	p Value
Ensure Students are Satisfied ^b	4.25	4.71	0.458	<.0001
Motivate Students to Engage ^b	4.29	4.81	0.517	<.0001
Effectively Manage Group	4.78	5.15	0.368	<.0001
Effectively Manage a Group in Which One Student Dominates	4.15	4.75	0.593	<.0001
Solve Problems That May Arise Independently ^b	4.34	4.88	0.542	<.0001
Solve Interpersonal Conflicts in Group ^b	4.26	4.66	0.393	.001
Articulate Complex Ideas	4.53	4.90	0.373	<.0001
Help Students Work Through Problems	4.57	4.96	0.385	<.0001
Adjust When Things Don't Go as Planned ^b	4.34	4.99	0.653	<.0001

^a 0–6 scale: 0 = *no ability*; 6 = *excellent ability*.

^b Item adapted from AWE Undergraduate Engineering Mentor Survey.

the year, ranged between 4.5 and 5 on a 0–6 scale (0 being *strongly disagree* and 6 *strongly agree*), reflecting an overall strong sense of improvement. These data are presented in Table 3.

We also found that peer leaders were less likely in spring than in fall to feel they might switch majors, which is not surprising given the amount of energy and commitment they devote to the subject matter throughout the program.

In the Peer Leaders' Own Words

The peer leaders themselves are the best voices for describing the impact of the experience. Below we offer excerpts from several peer leaders' reading reflection papers, exploring ways in which their thinking has changed over the year. These peer leaders' comments suggest an increase in sophistication in the way they think about their roles.

The first of these excerpts addresses group dynamics. This peer leader has seen the workshops become livelier, and attributes this, at least in part, to developing confidence:

I cannot stress the importance of the first GSW session more in promoting [good] group interaction. I wish I was aware of its importance fall quarter—the group dynamic was completely different fall quarter, the students were all unsure of themselves, and more nervous to speak up in the workshop setting. The difference between the two quarters is that winter quarter, I was surer of myself, and we also did two weeks of fun, cheesy icebreakers, which really made everyone laugh. Consequently, everyone felt comfortable enough to even correct another student's misconceptions.

The second quote describes struggling to find a balance between serving as a teacher and serving as a facilitator or coach. This

peer leader admits to grappling with the teaching-coaching tension, and this admission in itself demonstrates a thoughtfulness that usually comes only with some reflection on experience:

I find myself struggling with teaching vs. facilitating. It is a difficult situation, because most times the students come to workshop without a firm grasp of the material—they haven't reviewed their notes or done problems on the subject, because they've only just covered it in class. So in order for them to understand and complete the problems on the worksheet, they need at least a basic understanding of the concept, which usually involves me having to get up and explain it to them.

The third excerpt addresses students' tendencies to study "for the test." In this excerpt the peer leader relates a moment of insight: coming to better understand the variety of motivations for studying, and the possible effects of each:

Personally, I have had a random occasion whereby one of my students asked me exactly why the formula is as such, and it

dawned on me that I, too, did not know the answer. I was honest with him, and upon researching for the answer to tell him the following week, I realized it was not difficult at all; it was just that students like us simply take the equation for granted and applied it to the questions in the tests and exams, because we are grades-oriented—we study to do well, rather than to analyze how the formulas and equations came about. With the amount of studying time that we have, it is really difficult and seemingly impractical to think deeply and ponder over an equation when mere memory work would have easily gotten us through the problem.

The final quote addresses the learning approach of students in the peer leader's workshop. This peer leader describes much the same phenomenon as the previous—students looking just for procedural, and not conceptual, knowledge—but has noticed a change over time, thus highlighting the contrast between these two approaches to learning:

After a quarter of facilitating GSW, I am starting to see a change in the attitude towards the worksheets. In the beginning

TABLE 3.
Peer Leaders' Perceptions of Improvement in Areas Related to Course Goals

Item	Perceived Improvement Score ^a	
	<i>M</i>	<i>SD</i>
Understanding the Small-Group Learning Experience	4.94	0.865
Recognizing Differences Among Students	4.73	1.068
Adjusting Approach for Different Students	4.55	1.037
Understanding Group Dynamics	4.84	0.999
Identifying How Diversity Influences Group	4.32	1.031
Helping Students Change Thinking	4.67	0.940

^a 0–6 scale: 0 = *not at all*; 6 = *to a great extent*

of the year, many of the students simply asked questions about the problems, only wanting to know how to do the problems. Towards the end of last quarter and so far this quarter, there are more questions about concepts related to the problems. Also, last quarter it was mostly the upperclassmen of my group who would ask questions. Now, everyone is participating, seeking to understand the material behind the problems.

The contrast described in this last excerpt reflects the deep–surface distinction identified originally by Marton and Säljö (1976), with surface approaches characterized by memorizing to reproduce information and lacking reflection, and deep approaches characterized by seeking to truly understand concepts and using higher-level principles to organize information (Biggs, 1999; Entwistle, 1997, Prosser & Trigwell, 1999). These comments also mirror Nyquist and Sprague’s (1998) and Robinson’s (2000) descriptions of graduate teaching-assistant development as beginning with concern over self-presentation and focus on classroom management and moving eventually to interest in student learning—in exploring and creating new knowledge.

DISCUSSION

In the program we have described in this paper, student peer facilitators enter with a great deal of content expertise—they know the science or math material that they are asked to help others learn. However, just as Tien et al. (2004) found in their study of a peer-led team-learning program, our students often lack the general leadership skills they will need to successfully guide other students in learning effectively.

Despite this initial lack of knowledge, and despite academic and career goals that, for the vast majority, do not include educational

leadership, our students have clearly developed as leaders in an educational setting and, perhaps more important, clearly value that development. They also appear to have developed, by the end of the year, a fairly sophisticated understanding of their own development as leaders in this context.

What were the qualities of the training program that may have contributed to this success? Over the past several years, our training staff have identified, through review of program data and through reflection and discussion, three broad challenges that the program has needed to overcome in order to succeed. The approaches we have taken to addressing these challenges will be instructive to other programs with similar goals and student populations—in particular, students who are learning to become leaders “along the way” to achieving their main goals.

Following is a discussion of these three key challenges and our steps to overcome them. These challenges relate to the students’ level of interest in taking responsibility for course requirements; their attention to practical, opposed to academic, concerns; and their focus on STEM studies as opposed to academic areas more in line with educational leadership.

Challenge 1: Peer-Leader Accountability for Training Course Requirements

Our peer leaders are students highly motivated to succeed and highly strategic in approaching goals. Accordingly, they are generally not motivated to put effort into tasks that will not help them move toward their goals. For a number of years, our training course was graded pass/fail, and peer leaders often put less effort than we felt was appropriate into the course. For instance, many students turned assignments in late, often putting seemingly little effort into producing them, and many project group members complained that others

weren't pulling their weight. So, although we do not want the training course to become a source of competitiveness or anxiety for our peer leaders, we moved to a graded system to motivate them to make the course a priority.

We have also introduced new feedback systems to improve accountability, including personal written feedback on all assignments, feedback in group project meetings, and feedback from peers and senior leaders on facilitation practice. With all of this, we strive to provide feedback that is formative more than summative. As MacLellan (2001) asserted, learning can be enhanced when students perceive feedback as designed to help them improve rather than to grade them. We make this philosophy clear to them: When we provide feedback, whether on written assignments, participation in group projects, or facilitation sessions themselves, we explicitly offer the feedback in terms of seeking to help them improve. Open-ended comments from students on course evaluations suggest that this approach works: One of the most frequent comments is that the feedback they receive helps them improve.

In the nearly three years since we made these changes, we have seen a substantial increase in student accountability, with nearly all students turning assignments in on time, putting thought and effort into assignments, and participating actively in group projects.

Challenge 2: Students Motivated by Practical Concerns

As we note above, although one of our goals in the training course is to introduce peer leaders to theory and research on teaching and learning, what peer leaders themselves value most is practical information. In fact, a number of peer leaders have over the years expressed frustration at having to read and discuss research-based or theoretical articles. This frustration may stem from their

developmental level as leaders: As Nyquist and Sprague (1998) described and as others (e.g., French & Russell, 2002; Robinson, 2000) have found, these beginning-level teachers may still be focusing on classroom management and not yet comfortable approaching pedagogy. We also know, as Jacobs and Newstead (2000) have noted, that undergraduates are motivated by a variety of factors, many of which lie outside of the content of the course itself. This was very much the case with our students, who overwhelmingly report to us that they are primarily driven by professional goals such as enhancing a résumé or preparing for medical-school entrance exams. Our students are also engaged in an ongoing job (facilitating) that they often find challenging and so are looking for help with doing that job well. These goals are all rather instrumental—they are tied to success in some endeavor apart from the course itself—and so it is logical that the students would value the course more highly the more relevant it seems to be to their facilitation practice or to their ultimate academic or career goals.

In response, we have weighted the mix of assigned readings more toward the practical, still including several strong foundational readings to help ground peer leaders in teaching and learning theory, as well as to help them understand how effective practice results from well-conducted educational research. We also now offer short facilitation workshops throughout the year, focusing on topics such as collaborative learning, active learning, and problem-based learning. These workshops are highly interactive and focus on concerns of practice; participants' feedback has been generally quite positive. In both workshops and assignments, we frequently talk about the connections between the leadership, teaching, and other skills they are gaining now and the work that they will ultimately do in their chosen careers.

Challenge 3: Students Focused on STEM Studies

For the most part, our peer leaders are STEM majors or pre-med students, so most of them have not taken many social science courses. Although they have chosen to become peer leaders because they find the opportunity valuable, typically their interest lies in science or math, and they may not enter the training course with interest in issues related to teaching and learning. This may be a further reason that peer leaders sometimes have difficulty seeing the value in course readings and assignments, particularly when they are not obviously related to the practice of leading groups. Moreover, because these students are taking the training course as a requirement to work as facilitators, and because the content is not obviously related to their major fields, they tend to see the assignments as extra work—work they have to fit in around their core studies. Knowing this, we have tried to create assignments that are not only manageable (short papers, digestible readings, one-hour training sessions) but also meaningful, to us and to them. With each assignment, we make an effort to explain our reasons for asking them to complete it, and as much as possible, we try to create assignments that will also feel meaningful to the students.

Although the peripheral place of the course in students' eyes presents a challenge for us, we view this challenge as an opportunity to introduce students to ways of thinking that may be unfamiliar to them. We often hear from peer leaders that they had never considered, say, the impact of group development on the workshops, or the importance of factors such as self-efficacy in learning. In fact, a peer leader will occasionally tell us that the experience has prompted an interest in teaching as a career. But even for peer leaders who go on to medical school or careers in industry, we believe that

the awareness and interest in pedagogy they develop during the course will allow them to make important and unique contributions during their professional lives.

The Students' Development as Leaders

Komives et al. (2006), in a leadership development model formulated through a qualitative study of college student and recent graduates, identified five critical components of an emerging leadership identity. These are a range of experiences in groups, developmental influences such as role models, a changing view of one's relationship to others, a broadening view of leadership, and a developing sense of self. We believe that the peer leaders trained in our program experience each of these. Through their practice in their own groups and their experiences in and observations of others' groups, through their relationships with more experienced leaders, and through the readings and reflection they engage in over the year, we have seen these students develop as leaders and as people. On the whole, they emerge more confident, more humble (in that they recognize the difficulty of leading well), more understanding of other students' struggles, and more reflective of how learning happens and what helps it happen well.

And this development takes place without students having sought it—or in some cases, even realizing it. In a discussion of what is termed *incidental learning* in an organizational context—informal but critical learning that happens in the context of one's work activity—Marsick and Watkins (2001) noted that learning “along the way,” as we have put it, typically involves some triggering event, after which the learner interprets the event, considers various solutions, attempts to learn what is necessary to decide among them and carry out the best one, reflects on what has happened, and, as a result, reframes his or her

understanding of the event and its context. All of this happens while the learner's day-to-day work goes on as usual. For our peer leaders, the triggering event is most often some problem they face in their workshops: an overly talkative student, an unprepared group, a moment of realizing that they do not know how to solve one of the worksheet problems. Following Marsick and Watkins' suggestion, we have tried to provide a great deal of support to peer leaders making their way through this learning process, and we have seen ample evidence that they make their way successfully.

When they enter our program, our peer leaders see themselves as science learners first and developing leaders second. Because leadership will remain a critical part of their professional lives, we want them to begin to see these two roles as tightly connected. Perhaps our most important goal, then, is to

help students develop their understanding of leadership, to begin to view it as an integral part of being a professional person. To become a doctor or scientist—as most of them will do—or to become a professional in any field, for that matter, requires teaching and leadership skills that students don't ordinarily have the chance to develop while still in college. We hope that our peer leaders come to view leadership training not as an activity on the periphery of their core studies, but rather as a fundamental part of the preparation college offers them for their future professional and civic lives.

Correspondence concerning this article should be addressed to Marina Micari, Searle Center for Teaching Excellence, Northwestern University, 627 Dartmouth Place, Evanston, IL 60208; m-micari@northwestern.edu

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