

Communication, Communication, Communication! Growth through Laboratory Instructing

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Abstract This study examined gains undergraduate students made in their communication and collaboration skills when they served as peer teachers, i.e., laboratory instructors (LIs), for a General Psychology laboratory. Self-ratings of communication and collaboration skills were completed before and after teaching the laboratory. When compared to before the teaching experience, the students rated their skills significantly higher in written expression, oral

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expression, and participation skills. They also rated themselves significantly higher in written comprehension and expression skills than did a comparison group of non-LIs. Results from interviews also revealed beliefs that their communication and collaboration skills had substantially increased.

Keywords Peer teaching · Communication skills

Employers consistently cite communication and collaboration skills as some of the most valued skills in employees (Casner-Lotto & Barrington, 2006; Landrum & Harrold, 2003). We believe that involving undergraduate students in teaching their peers can enhance their communication and collaboration skills and contribute to preparing them for their future careers. In higher education peer teaching, a role in which students go beyond tutoring and lead a group of students in learning activities (i.e., lecture, lab activities, grading), is an enriching experience for everyone involved; and it effectively supports student learning (Smith, 2008). The purpose of the study we report here was to investigate gains in communication and collaboration skills that students perceive they make when they lead their peers as teachers.

Peer tutoring, which differs from peer teaching, is an arrangement that benefits many: the tutees, the tutors, and the professors. Several studies have explored the actual and perceived gains that students made as peer tutors, as described in Roscoe and Chi's (2007) literature review, and have found that tutors make gains in their confidence, oral expression skills, and listening skills. However, when students go beyond tutoring to a teaching role in which they are leading a group of their peers and are in a position of greater power, how are their skills enhanced?

Research has shown that undergraduate students in peer teaching roles self-report experiencing an increase in communication and collaboration skills (Coker & Van Dyke, 2005; Fingerson & Culley, 2001; Jackling & Macdowall 2008; McKeegan, 1998; Roderick, 2009; Schalk, McGinnis, Harring, Hendrickson, & Smith, 2009). For instance, peer teachers in one study reported increases in speaking, writing, and teamwork skills (Coker & Van Dyke, 2005). Qualitative evidence from another study found that peer teachers reported an improved ability to communicate with students and that they experienced positive and supportive collaborative relationships with faculty members and other peer teachers (Fingerson & Culley, 2001). Researchers also found that peer teachers reported valuing teaching and believed that it helped them develop greater future opportunities (Jackling & Macdowall 2008; Schalk et al. 2009). Moreover, many indicated that their teaching experience fostered an interest in becoming a professor (Newcomb & Bagwell, 1997).

Thus, students in both peer tutoring and teaching roles gain from the experience in multiple ways. In our review of the literature we found only two articles that described peer teaching roles for undergraduate students that are at the level of engagement and responsibility expected of our General Psychology laboratory instructors (LIs; Hogan, Norcross, Cannon & Karpiak, 2007; Newcomb & Bagwell, 1997). One article described a peer teaching program, but it only speculated on the gains peer teachers experienced (Hogan et al., 2007). A second article reported that peer teachers had written essays after their teaching experience in which they described learning more about teaching, making gains in academic skills, and developing personally (Newcomb & Bagwell, 1997). These two studies did not formally evaluate the gains students made in communication and collaboration skills with pre- and post-tests or a comparison group. Thus our purpose was to document more carefully the perceived gains

students make in a peer teaching position, one in which they hold considerable responsibility for teaching their peers.

Peer Teaching Model: Psychology Laboratory Instructors

At our institution, the General Psychology course has an integrated laboratory component that gives students hands-on experience engaging in psychology. Our laboratory is an innovative practice as few institutions have a hands-on, integrated laboratory for introductory psychology courses, but it is a practice that is gaining attention and advocacy at the national level (American Psychological Association Board of Educational Affairs, 2013). The laboratory is required of all students enrolled in introductory psychology, which is unlike models at other institutions in which the laboratory is only for students majoring or minoring in psychology.

A distinctive aspect of our integrated laboratory is that it is taught by laboratory instructors (LIs) who are advanced undergraduate students. Eight to twelve LIs independently and individually teach a 75-minute, weekly laboratory session for approximately 15 students each semester. The LIs follow a lesson plan and lead activities that introduce students to research methods in psychology and scientific writing. Students in the laboratory perform a literature review, conduct three empirical research studies (an observation, an experiment and an archive study), and write an APA-style report for each.

A recent study (Thieman, Clary, Olson, Dauner & Ring, 2009) revealed that students in our laboratory made significant gains on a critical thinking/research methods test from the beginning to the end of the semester. Further, students who took the integrated laboratory course scored higher on the test at the end of the semester compared to a group of students who took an introductory psychology course without a laboratory. Thus, teaching introductory psychology with an integrated laboratory has been shown to be effective in fostering critical thinking skills in psychological research methods.

In addition to teaching the laboratory each week, LIs provide students with writing instruction and feedback, hold a weekly office hour, and attend weekly instructional meetings. Faculty mentors provide LIs with lesson plans and lead the weekly instructional meetings, in which we discuss laboratory activities, pedagogy, and student issues. As the laboratory is for all students enrolled in the course, the LIs are unique in their peer teaching role. Often peer teachers lead a group of self-selected students who are seeking additional help, or peer teachers lead study sessions for students who are required to participate because they are at risk of failing (i.e., supplemental instruction). Our LIs teach students at all ability levels in one heterogeneous group. Thus, they gain an understanding of what it is like teach students who are both struggling and excelling.

Each spring the psychology faculty selects the LIs – typically advanced undergraduates majoring or minoring in psychology. The requirements are that applicants have a GPA of 3.5 or higher on a 4.0 scale, earned a B+ or higher in Statistics, and have completed or are enrolled in an advanced psychology laboratory course. On the application they must answer questions such as the following. “What knowledge, skills, and abilities do you possess that will make you an effective LI?” What experiences have you had teaching or instructing others and/or conducting scientific research projects? What did you learn through those experiences about leadership and collaboration?”

Before the fall semester begins the LIs attend two days of training. One focus of the training is on logistics: laboratory activities, policies, and procedures. Another focus of the training is

on skill building and preparing them to lead a class, interact effectively with their peers, and build rapport. The majority of LIs teach both fall and spring semesters; however, some LIs graduate after the fall semester or choose not to continue to teach in the spring. Some also teach for more than one academic year. LIs are paid a stipend equivalent to 75 hours of work each semester for teaching one laboratory section.

Within our model, the LIs need to communicate a breadth of information to the General Psychology students and collaborate with their faculty mentors and fellow LIs. Open and frequent communication that is clear, efficient, and sensitive to the students in the laboratory is essential to the success of our peer teaching model. The LIs also must navigate a considerable shift in power: within two days of training students move from being undergraduate students who are primarily “just” students to undergraduate students who function essentially as “junior colleagues” with psychology faculty members as their mentors. As an LI, students talk with faculty members about other students, curriculum, technology, student issues, and grading. Thus, they must maturely transition through this role change and feel comfortable collaborating with the faculty in the best interests of students in the laboratory. These skills – being able to communicate effectively and collaborate with others across changes in role and power – are vital to our peer teaching model and the students’ future success in the workplace (Casner-Lotto & Barrington, 2006; Landrum & Harrold, 2003). Based upon our experiences and our review of the literature, the goal of our study was to capture the growth the LIs experienced in their communication and collaboration skills. We hypothesized that they would make gains in their evaluation of their communication and collaboration knowledge and skills.

Method

Participants

We teach our integrated General Psychology laboratory at St. Catherine University in St. Paul, Minnesota, a private university in which the undergraduate college consists of women only. The undergraduate college enrolls roughly 3,600 full and part-time students each year, and psychology is the third most popular major (114 students declared themselves as psychology majors in fall 2012).

Using pre and post-surveys, two LI cohorts of 21 students were evaluated in this study: Fall 2010 ($N = 12$) and Fall 2011 ($N = 9$). We emailed the LIs a link to complete the surveys, and we asked them to complete the surveys within one week; completing the surveys was voluntary and not required. Twelve LIs provided complete, matching, pre- and post-survey responses; but several completed only one survey, or they completed both but did not provide matching codes for the pre- and post-surveys. Six LIs from these two cohorts also participated in semi-structured interviews. Two of the interviewed LIs had taught a lab for 6 semesters, one for 4 semesters, two for 2 semesters; and one LI had taught for just 1 semester.

Thirteen students with no LI experience comprised the comparison group, and we recruited these students from upper-division psychology courses. We assumed these students would have a similar academic experience as LIs in terms of their standing in a psychology major or minor, but with the major difference of not having served as an LI. We did not collect demographic data from our LI or comparison groups because we wanted to protect the anonymity of the students. Although psychology is a popular major at our institution, a

relatively small group of students comprise the program. Two of the authors of this article are professors in the department, and the other authors are either current or former students in the department. Collecting information such as GPA, classes completed, or native language could have made the participants identifiable. We wanted to make sure that students felt no pressure to complete the surveys. Thus, we collected data as anonymously as possible. Although this makes it difficult to compare the groups in terms of demographics, our first concern was to protect participants.

Instruments

Our communication and collaboration survey measured students' perceptions of their skills (Olson, 2000). We administered the same survey for pre- and post-testing. It consisted of eight subscales: written comprehension, written expression, oral comprehension, oral expression, participation, peer review, active listening, and collaboration (American Psychological Association, 2007; National Center for O*NET Development, 2010; Rider, Hinrichs, & Lown, 2006). Examples of items included are "I have effective reading skills" (written comprehension), "My written assignments are organized" (written expression), "I understand what I hear in my classes" (oral comprehension), "I communicate my ideas clearly when I speak" (oral expression), "I share my ideas with others in my classes" (participation), "I give useful feedback to others" (peer review), "I give my full attention to others when they are speaking" (active listening), and "I collaborate effectively with others" (collaboration). The survey used the Likert scale: 1 = *Strongly Disagree* to 6 = *Strongly Agree*.

In addition, we conducted semi-structured interviews in which we asked LIs about how the experience may have helped them in various areas of life (employment, academics, internship opportunities) or shaped their future goals. A few of the interview questions were as follows. "What was your motive in becoming an LI?, Can you give specific examples or situations from your LI experience that ended up benefiting you in any way (such as employment, internship opportunities, or academics)?," and "What areas do you think you've improved in that may help your professional future?"

Procedure

The Institutional Review Board at our institution approved this human subjects research, and the APA's Ethical Principles (2010) for research were followed in conducting this study.

Researchers emailed a link to the online pre-survey to all LIs prior to the training session for fall semester in 2010 and 2011. LIs gave informed consent, created a four digit code to match their pre-test results to the post-test results while maintaining anonymity, and then answered the survey questions. We administered the post-survey upon completion of the fall semester in the same online format.

Comparison group participants completed the same survey (the pre-test version) once at the end of the fall semester. We informed these participants that their responses would be compared to the LIs' responses; and, upon agreeing to participate in the study, we also emailed them a link to the online survey.

Additionally, we sent LIs who taught a lab during the 2011-2012 academic year an email asking them to participate in an interview. Those who were interested and available met with one of the researchers for an interview either in-person (5 LIs) or via Skype (1 LI). The interviews lasted 10-30 minutes and were audio-recorded. Interviews were semi-structured in

Table 1 Cronbach's Alpha for the communication & collaboration subscales

Subscale	Items	Pre-LIs Alpha	Post LIs Alpa	Comparison
Written Comprehension	2	0.48	0.84	0.87
Written Expression	5	0.88	0.83	0.93
Oral Expression	7	0.61	0.78	0.85
Peer Review	5	0.90	0.96	0.90
Participation	2	0.83	0.77	0.97
Active Listening	4	0.84	0.90	0.93
Collaboration	6	0.47	0.65	0.67

Note. The oral comprehension subscale consists of only one item so it is not included in the table above.

format: interviewers asked all participants the same questions, with follow-up questions varying slightly based on interviewees' responses.

Results

We present both quantitative and qualitative data results.

Quantitative Data

Participants responded to questions on the eight subscales in the communication and collaboration survey using a Likert scale from 1 = *Strongly Disagree* to 6 = *Strongly Agree*, with higher scores indicating greater confidence. Cronbach's alpha showed that the collaboration subscale did not have high reliability; therefore, results for that subscale must be interpreted cautiously (see Table 1). All other subscales had reliability greater than .80.

Descriptive statistics for each of the subscales is in Table 2. At the beginning of the semester, the LIs primarily responded to the questions with *Agree* (e.g. writing comprehension $M = 5.21$, $SD = 0.66$ and participation $M = 5.12$, $SD = 0.81$), and at the end of the semester the

Table 2 Descriptive statistics and comparisons for communication & collaboration

	LIs Pre			LIs Post			Comparison		
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
Written Comprehension	12	5.21*	0.66	12	.67*	0.44	13	5.19 ⁺	0.60
Written Expression	12	5.12*	0.52	12	5.62*	0.39	13	5.11 ⁺	0.69
Oral Comprehension	12	5.17	0.39	12	5.42	0.51	13	5.31	0.48
Oral Expression	12	5.12*	0.52	12	5.36*	0.36	13	5.24	0.55
Peer Review	12	5.03	0.70	12	5.47	0.68	13	5.22	0.78
Participation	12	5.12*	0.81	12	5.71*	0.50	13	5.19	0.75
Active Listening	12	5.46	0.44	12	5.54	0.44	13	5.31	0.47
Collaboration	12	5.08	0.47	12	5.40	0.39	13	5.06	0.68

* significant at $p < .05$ for LIs pre-test and post-test

⁺ significant at $p < .05$ for LIs post-test and comparison group

means had moved closer to *Strongly Agree* (e.g., written comprehension $M = 5.67, SD = 0.44$ and participation $M = 5.71, SD = .50$). The comparison group responded more often with *Agree* (e.g., written comprehension $M = 5.19, SD = 0.60$ and participation $M = 5.19, SD = .75$).

Dependent samples t-tests indicate that the LIs rated themselves significantly higher at the end of the semester compared to the beginning of the semester in written comprehension ($t(11) = 2.71, p = .02, r = .63$), written expression ($t(11) = 3.80, p = .003, r = .75$), oral expression ($t(11) = 3.48, p = .005, r = .72$), and participation ($t(11) = 3.22, p = .008, r = .70$). According to independent samples t-tests, they scored significantly higher than the comparison group at the end of the semester in written comprehension ($t(23) = 2.24, p = .04, r = .56$) and written expression ($t(23) = 2.25, p = .04, r = .56$).

Qualitative Data

We analyzed the interview data using grounded theory to gain a greater understanding of the impact being an LI had on students (Glaser & Strauss, 1967; Kuh & Andreas, 1991; Patton, 2002). Two researchers used an inductive approach to extract themes from each interview. A third researcher used a deductive approach, comparing the interviews to the themes to ensure that they matched. We present the themes that emerged from the interview data in Table 3 with the frequency of each theme and a representative quote. Several themes emerged: increased communication skills (especially written expression and oral communication skills), increased academic skills, increased confidence, increased collaboration skills, and new career paths.

The LIs found that their written expression skills had improved. According to one LI, “My own writing became more active as opposed to being in a passive voice which is critical for APA [style].” A previous LI who had begun a Master’s program said, “It’s made me a better writer, emphasized the importance of turning in quality work. My (master’s) thesis has been easier because I do know the APA [style] stuff.” The LIs commonly expressed increases in their communication skills, especially their written expression skills.

Table 3 Interview themes and overall frequency

Themes	Frequency	Response
Increased communication skills	14	It has helped a lot as far as being comfortable standing in front of a group of people and having more of a relaxed conversation...
Increased academic skills	13	It gave me the foundation for APA writing knowledge that I used in every one of my classes.
Increased confidence	13	If there’s something that I think is really hard, because I thought being an LI would be really scary and really hard...and I realized it wasn’t that bad! So if there’s an experience in the future and I want to do it but it seems daunting, then I’ll know I can do it.
Collaboration among lab team	11	I really like the community that we have. It’s different than a student teacher. I feel like they [faculty] really do treat you like colleagues in a lot of ways. I really value my relationships. They’re always willing to help you.
New career opportunities	10	I never really thought about teaching before, but I think now that I would love to be a professor.
Unique experience	8	...having that really unique experience, because it’s not very common for an undergrad to be able to teach.

Many LIs also believed that the teaching experience substantially improved their oral expression skills. One said that she was “comfortable standing in front of a group of people and having more of a relaxed conversation with them instead of...preaching to them.” Another commented, “[Teaching the lab] helped me in my confidence, I really don’t like public speaking. At first I was really nervous about it, but then you do it, it gets easier.” Another said the experience “...taught me to choose words carefully so it doesn’t just make sense to me but it makes sense to other people.” The interviews supported the prominent theme of increased confidence in oral expression skills.

LIs also described an increase in their confidence as a result of the experience, as noted above in how they described their growth in communication skills. However, one LI also described growth in overall confidence: “If there’s something that I think is really hard, because I thought being an LI would be really scary and really hard...and I realized it wasn’t that bad! So if there’s an experience in the future and I want to do it but it seems daunting, then I’ll know I can do it.”

Another theme was valuing the collaboration with and among faculty members and fellow LIs. One LI stated, “I really like the community that we have. It’s different than a student-teacher relationship. I feel like they [faculty] really do treat you like colleagues.... I really value my relationships with [faculty mentors]. They’re always willing to help you.” Another said, “It’s such an encouraging community...That camaraderie, those weekly meetings—I think it really helped me get through college.” Another said, “I actually feel a lot more confident in collaboration...We have a nice little community going and we’re all there for each other.”

A final theme that emerged indicated a change in some LIs’ future plans as a result of their teaching experience. One said, “I enjoyed the teaching aspect...I was very introverted when coming into college, so never really imagined I would ever teach... I always thought I would go into private practice, but now I feel I have more options for my future.” Another said, “Being an LI helped cement the idea that I really do love psychology.” A previous LI said, “I never really thought about teaching before, but I think now that I would love to be a professor.” An LI with a major in nursing said, “I really feel strongly that before I retire I would love to be able to teach psychology to nurses.”

Discussion

The results of our study indicate that the LIs thought that teaching an integrated General Psychology laboratory to their peers was a positive experience that allowed them to improve their perceptions of their communication skills as well as collaborate with faculty members as junior colleagues. We had hypothesized that they would report making gains, in communication and collaboration skills compared to peers who did not teach a laboratory. Our hypothesis was partially confirmed. The LIs rated themselves as having made significant gains across the semester in the areas of written comprehension, written expression, oral expression and participation. Further, their self-assessment of written comprehension and expression skills was higher than the comparison group at the end of the semester.

However, it has been well documented that people have difficulty objectively assessing their own skills (Dunning, Johnson, Ehrlinger, & Kruger, 2003); and researchers in the field of communication studies often cite the flaws inherent in using self-report to assess one’s skills. Nonetheless, they also acknowledge that it is important to measure self-perceptions of communication skills (McCroskey & McCroskey, 1988) because self-perceptions can influence one’s performance. Individuals at the same skill level can perform differently depending

upon their perceptions of their skills (Bandura, 1993; Li, Long & Simpson, 1999). Moreover, one's perceptions of communication skills influences how one communicates information and even the career one pursues. Thus, even though the results of our communication measure are based upon perceptions, we believe they are informative as an individual's confidence in the ability to communicate clearly and effectively can have an impact on the actual ability to communicate.

Although there was no significant difference from pre- to post-test scores on LIs' self-reported collaboration skills and no significant difference between the LIs and the comparison group in this skill area, LIs did describe their collaboration as productive. They found the lab instructional team to be a supportive one in which they could communicate openly. Future research can capture how LIs transition from a primarily student role to a junior colleague role, one in which they have some power and are treated as collaborators in student learning. Further, we can capture how LIs grow as a result of this collaborative environment in which faculty depend upon students to make the laboratory a success. The quotes we did capture from LIs regarding collaboration seem to support this notion that the LIs understood that they transitioned into a more powerful role than that of a non-LI. Further, comments indicated that they understood the roles, responsibilities and benefits of being a trusted junior colleague of faculty members. Deeper exploration of this aspect of the peer teaching model could shed additional light on collaboration skills and growth among LIs.

These results support the findings of other researchers who have examined the self-reported gains undergraduate students make in communication and collaboration skills when they serve as peer tutors or teachers (Coker & Van Dyke, 2005; Fingerson & Culley, 2001; Good et al. 2000; Jackling & Macdowall 2008; Micari et al. 2006; Roderick, 2009; Schalk et al., 2009). Further, this study adds to this body of literature by focusing more specifically on gains within the broader construct of communication skills and comparing those gains to those reported by students who did not have the peer teaching experience.

There are limitations in our attempt to capture the growth that can occur in this peer teaching model. Our sample may limit the generalizability of our results and the ability of others to replicate this model. This peer teaching model is used at an institution in which the undergraduate college is a women's college. Previous researchers have documented that students who attend women's colleges tend to engage more actively and deeply in their education than women who attend co-educational colleges (Kinzie, Thomas, Palmer, Umbach & Kuh, 2007). As our peer teaching model relies heavily upon the LIs to teach the curriculum with zeal, it may not be possible to implement this at other institutions, or similar results may not be found if it is replicated. However, when the founding faculty created the integrated laboratory roughly 15 years ago, they collaborated with faculty at a co-educational institution, where a similar model was implemented only for students in an introductory psychology class who planned to major or minor in psychology. Faculty at this institution have documented the success of their model for students in the course, but they have not documented the impact of teaching on the LIs (Clary, Olson, Sherman & Thorsheim, 2003). Therefore, although our sample is distinctive, we do believe this peer teaching model could, and should, be replicated at other institutions.

In addition to our unique sample, our sample is small as it focuses on just two small cohorts of self-selected students. Although nearly all of the LIs completed pre- and post-tests, several of them did not use the same four-digit identifier on pre- and post-tests; matching the two tests was not possible and resulted in unusable data. There may also be an issue of self-selection, as the LIs are some of our best students. Students who apply, or are encouraged to apply, to be an LI are often selected because they are the students who actively participate in class, already have strong writing and speaking skills, and work well with their peers. Yet we do have many

excellent students who do not apply to be an LI, and our comparison group data (although reliant upon self-report) captures this.

Another limitation to our study is that we collected data from our comparison group only once. Given the practical restraints of our study (no incentives, small pool from which to sample), we recruited as many students to complete the surveys as we could; however, we were unable to get a sizable number of students in the comparison group to complete the surveys a second time. Thus, our limited data collection with the comparison group does not capture growth and development over the course of the semester.

In the future, more creative approaches to measure and understand the growth experienced by peer teachers and tutors would be worthwhile pursuing. For example, one could have LIs (or peer tutors) keep a weekly record of their positive and negative experiences, specifically focusing on communication and collaboration. Also, weekly instructional meetings could be recorded to capture any difficulties that the LIs are experiencing as well as moments of learning and growth. We have also considered recording students giving oral presentations both before and after a semester of teaching the laboratory to document oral communication skills and collecting writing samples before and after a semester of teaching to document written expression skills.

Researcher-LI Reflections

Four of the authors of this manuscript are current or former LIs, and personal reflections may further explicate the impact of this peer teaching experience. These reflections are as follows.

We have personally experienced the growth in skills and confidence that is documented in this research report, and we feel that teaching the psychology laboratory is an invaluable experience and an opportunity to get a sense of what it would be like to be a professor. We all feel that we have made strong gains in our leadership abilities and our ability to communicate and collaborate through writing and speaking. The weekly practice of teaching students new concepts has increased our comfort levels and our abilities to communicate effectively to a group. Much like the LIs in this study, we also enjoy the support provided by the professors and fellow LIs. We feel a sense of community within our LI group that has allowed us to thrive in our learning and college experience. We all have had to navigate difficult situations with students, which sometimes pose unique ethical dilemmas; and we have had to solve problems with technical difficulties that test our poise and oral communication skills. In all, we firmly believe that the LI experience has been a wonderful opportunity to learn and grow, and each one of us will go forward with our confidence in our abilities strengthened due to being LIs.

Conclusion

In sum, our peer teaching model, one in which students have considerable responsibilities and privileges as junior colleagues, benefits both the students in the course (Thieman et al., 2009) and the students teaching the laboratory. Although this study did not lead to conclusive results regarding gains students made in communication and collaboration skills, it has captured the self-perceived gains that students make in their confidence regarding their communication skills and the impact of a positive collaboration experience. Providing undergraduate students with opportunities to teach their peers can increase their confidence in their communication skills, which may have an exponential impact upon those students' future academic, career, and personal goals. The opportunity to be part of a supportive and positive collaboration can

also have a broad impact upon students' professional careers because they will understand the benefits of collaboration and know how to make positive contributions. We recommend this approach to others.

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