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A Convergent Mixed-Methods Exploration of the Effects of Community-Engaged Coursework on Graduate Student Learning

Lauren M. Dinour, DrPH, RDN; Jacalyn Szaro, MS; Renata Blumberg, PhD; Mousumi Bose, PhD

ABSTRACT

Objective: To examine the impact of a community-engaged assignment on graduate student learning in the nutritional sciences.

Design: Convergent mixed-methods design with parallel data collection and terminal merging of data. Data were composed of grant proposals, reflection papers, and informal course evaluations from 2 semesters of the same course. Fall students wrote proposals on behalf of a community partner whereas spring students wrote fictitious grants to improve nutrition on their campus.

Setting: A large public university in northeastern US.

Participants: Students enrolled in the fall (n = 19) or spring (n = 14) semester of the same graduate nutrition course.

Phenomenon of Interest: Grant quality, student engagement, and collaboration with peers.

Analysis: Quantitative rubric-based rating of grant proposals, emergent and thematic qualitative coding of open-ended responses, and independent-samples *t* test of Likert-scale questions. Data were compared between semesters and reported in a contiguous narrative approach.

Results: Students across semesters experienced academic and personal gains from the assignment. Comparatively, fall students expressed enhanced engagement, improved group dynamics, more frequent application of the assignment to their lives, and a better aggregate grant score.

Conclusions and Implications: Both experiential and community-engaged coursework can enhance learning outcomes at the graduate level and prepare students for careers in nutrition.

Key Words: community engaged learning, comparative study, experiential learning, graduate education, nutritional sciences (*J Nutr Educ Behav.* 2018;50:598–609.)

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INTRODUCTION

Experiential learning is a process that allows students to learn through experience and reflection. Drawing from the works of Jean Piaget, Kurt Lewin, John Dewey, Paulo Freire, and others, Kolb^{1,2} established Experiential Learning Theory, portrayed as a learning cycle of concrete experience, reflective observation, abstract

conceptualization, and active experimentation. Community-engaged learning, also known as service learning, is a form of experiential learning and a fundamental component of education.³ Community-engaged learning aims to enhance the connection between community-based work and course material and can be a successful pedagogical tool at all grade levels, including higher education.^{4,5}

Research has identified many beneficial outcomes from service learning activities, such as the development of interpersonal and leadership skills, higher test scores and grade point averages, and deeper understanding of course material.⁶⁻⁸ Service learning in higher education also has a positive impact on social and cultural outcomes because students become more aware of diversity and difference.^{9,10}

In the US, the field of nutrition and dietetics has grown substantially owing to longer life spans, increasing obesity rates, and the preventative role nutrition has in health. Employment in these fields is projected to increase by 16% from 2014 to 2024, a rate much faster than the average for all occupations.¹¹ Within higher education, community-engaged learning can be integrated into the nutrition and dietetics field for students to expand

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their knowledge and prepare them for this growing profession. Nutrition students can discover their future job direction and gain hands-on experience needed for entry-level registered dietitians.¹² In fact, in 2012 the Academy of Nutrition and Dietetics Council on Future Practice recommended that dietetic programs incorporate learning that takes place out of the classroom to “develop students’ critical thinking, leadership, communication and management skills by providing opportunities to experience them in the context of professional work settings.”¹³ Given this direction for current and future dietetics programs, it is necessary for dietetics educators to have evidence-based models of service learning approaches within the field of nutrition. Likewise, entry-level registration eligibility education requirements for registered dietitians is moving from a baccalaureate degree to the minimum of a graduate degree as of January 1, 2024.¹⁴ Thus, effective service learning models within nutrition education are needed at both the undergraduate and graduate levels.

Students can benefit from community-engaged learning on academic, professional, and personal levels through active collaboration with peers.

Several studies have analyzed the impact of community-engaged learning within nutrition sciences at the undergraduate level.^{13,15-18} For example, students in 1 nutrition service learning course better applied nutrition knowledge to real-life settings,¹⁵ whereas students in another service learning course showed significant improvements from baseline in areas such as teamwork, inspiring support, recognizing others’ contributions, and collaboration.¹⁶ At the graduate level, nursing, nutrition, and pharmacy students at 1 school collaborated to treat an elderly population. The cultural skills and knowledge of the nutrition graduate students and dietetic interns significantly increased. In addition, there was a decrease in the malnour-

ished category of this elderly population as a result of the nutrition education and interventions provided by the students and interns.¹⁹ In another graduate-level nutrition course, students provided nutrition education to local elementary school students. Positive learning outcomes were noted for both the graduate and elementary school students.³

Although these examples highlight the benefits of community-engaged learning opportunities in the nutritional sciences, they are mostly focused on single-semester outcomes and do not often provide comparisons with other pedagogies. Studies at the graduate level in other health-related professions reported on the successes of community-engaged learning methods,^{20,21} but again they often used a case study approach without comparison groups. Given the sparse literature analyzing and comparing community-engaged learning within graduate nutrition courses,^{3,19} the purpose of this study was to evaluate a community-engaged assignment within a graduate nutrition course on student learning and related outcomes.

METHODS

This study used a convergent mixed-methods design²² to compare 2 sections ($n = 33$) of the same graduate course, Current Applications in Nutrition, taught during the 2015–2016 academic year at a public university in the northeastern US. The course is required for students to earn a master of science degree in nutrition and food science. In fall, 2015 (F15), the course was offered with a community-engaged learning assignment, whereas in spring, 2016 (S16) it was not (although it was still structured using Kolb’s¹ Experiential Learning Theory). The same instructor taught both sections and each semester lasted 15 weeks. The intentions of the course were for students to develop detailed, in-depth knowledge of recent findings in human nutrition and to apply this knowledge by learning how to write a research proposal. The syllabi, lectures, and assignments for both semesters were the same with 2 exceptions: (1) an additional grant writing workbook was required in S16

because of student feedback from F15, and (2) an informal (ungraded) peer review critique activity was included in F15 and formalized (graded by the instructor based on feedback students provided to their peers) in S16.

Community-Engaged Learning Class

The most substantial difference between semesters was in the development of a fundable project idea. In F15, the instructor partnered with a local elementary school’s parent-teacher association (PTA) that was looking for grant money to expand the elementary school’s garden program. The PTA provided the graduate students with a list of ideas for garden projects they wanted to pursue as well as a tour of the school grounds, garden, and storage spaces. For their first assignment, students were required to identify active funding opportunities that (1) were appropriate to support 1 of the PTA’s ideas; (2) allowed the PTA to submit the proposal, via eligibility requirements; and (3) had submission deadlines at or after the end of the semester. Students were then divided into 4 groups of 4–5 students, and each group was assigned a project scope and grant funding opportunity. No group had the same project or funder, and grant requirements and formats differed among groups. Projects focused on expanding the size or seasonality of the school’s garden, obtaining and implementing a garden-based curriculum, or purchasing and using a kitchen-on-a-cart to teach students food preparation techniques in the classroom. Funders were composed of local and national education associations, a local nonprofit organization, and a food company.

Each week, groups drafted 1 section of the grant proposal: needs statement, goals and objectives, program plan, evaluation plan, and budget. The PTA members were available for consultation via e-mail to answer questions regarding school administration, financing, and feasibility. Toward the end of the semester, groups submitted a draft of their complete grant proposal and each student peer-reviewed another group’s proposal, making suggestions for additions or

changes. Groups also formally presented their proposals to the PTA, and PTA members, the instructor, and classmates provided feedback so that groups could revise their proposals for final submission to the instructor. Once the semester ended, the instructor made minor edits to the proposals and sent them to the PTA, which then submitted each proposal to its respective funder before the deadline.

Traditional Class

No community partner was identified to replicate the learning experience from the fall. However, prior iterations of the course made it clear that students needed both direction and boundaries when developing fictitious project ideas. Thus, students were individually required to identify a nutrition-related need on their university's campus and to brainstorm ideas for projects to address that need. Students were then assigned to groups of 4–5 in the same manner as in F15, and presented their individual project ideas to their group. After discussion and deliberation, each group decided on 1 project for which to write a grant proposal. Interestingly, all 3 groups separately identified a need for healthier food on campus, and decided to write grants to fund a new greenhouse and/or garden at the university.

Students were then asked to find active grant funding opportunities that (1) were appropriate to support their group's project, (2) allowed a university faculty or staff member to submit the proposal, via eligibility requirements; and (3) had submission deadlines that had not yet passed. Groups decided on the grant opportunity that best matched their project. These included 3 different grant opportunities funded by the US Department of Agriculture. The semester proceeded as it had in the fall, with groups drafting 1 section of the grant proposal each week. In addition, students were encouraged to tour areas of campus that might be appropriate locations for a greenhouse or garden. Toward the end of the semester, groups submitted a draft of their complete grant proposal and each student peer-reviewed another group's proposal, making suggestions for additions or changes. Groups also

presented their proposals to the class, and their classmates and the instructor provided feedback so that students could revise their proposals for final submission.

Data Sources and Analysis

To assess whether and how student learning was affected by the community-engaged grant assignment, the researchers used parallel data collection and terminal merging²² of 3 data sources to compare outcomes between semesters. These data sources were chosen to provide insight into students' active experimentation, reflective observation, and abstract conceptualization, 3 of the 4 learning modes in Kolb's¹ Experiential Learning Theory. The Montclair State University Institutional Review Board approved this protocol after an exempt review under Category 1, research on the effectiveness of or comparison among instructional techniques, curricula, or classroom management methods.

Final grant proposals. The first data source was the final grant proposals, used to understand students' active experimentation in applying their grant writing skills gained over the course of the semester. Proposals were required to meet all specifications of the funder, so each submission was slightly different. Nevertheless, all grant applications included similar sections, including a needs statement, project objectives, program and evaluation plan, and budget, with 1 exception. One grant application from F15 required only 4 summative paragraphs, each of which was limited to 520 characters (including spaces, roughly 70–80 words), which made it difficult to compare it with the other proposals and assess it with a standardized rubric. As a result, this grant proposal was not included for analysis. The final analytic sample was composed of 6 grant proposals, 3/semester. Each grant was assigned a random code number and all student names were redacted.

To analyze proposals, 2 nutrition faculty members with histories of successful grant writing, but unaffiliated with the course, independently rated all 6 grants using a rubric adapted from the US National Institutes of Health.²³

The rubric asked reviewers to score grants on the following criteria: significance, investigators, innovation, approach, environment, and presentation (see [Supplementary Figure 1](#) for criteria definitions). Criteria scores ranged from 1 (exceptional) to 9 (poor)²⁴ (see [Supplementary Figure 2](#) for score definitions), with the total possible score between 6 (highest) and 54 (lowest). Both faculty members were aware that these were student-written grants for a graduate course and that the study was focused on evaluating community-engaged learning outcomes for students.

Both criteria scores and total scores were compared between reviewers and averaged. Grants were also ranked in order of their final score to identify the highest and lowest rated grants. After all numeric analysis was completed, grants were re-identified with the semester in which they were written so that cross-semester comparisons could be made. This included calculating an aggregate (summative) semester score for each criterion and comparing across semesters.

Reflection papers. Toward the end of each semester, students were required to write a reflection paper describing what they learned from the grant assignment, what additional questions were raised, what they would have done differently if starting again, how their team functioned as a whole, and what grade they felt their team earned, with justification. These reflection papers were used to gain insight into students' reflective observation and abstract conceptualization of what they learned. Reflection papers (n = 32) were deidentified, randomly assigned a code number, and uploaded to ATLAS.ti for Mac (version 1.5.4, ATLAS.ti GmbH Berlin, Germany, 2017). One F15 reflection paper was missing because it had been submitted via hard copy and returned to the student. Reflection papers from students of the excluded F15 grant were included for analysis.

Two researchers (one of whom was the course instructor and the other of whom was a research assistant) independently and qualitatively analyzed all reflections in an iterative process adapted from Zimmerman et al.²⁵ This strategy started with a line-by-line review of each reflection paper to

prepare data chunks, followed by inductive coding of each data chunk to reflect and interpret the reality of the data. No preestablished coding schema was developed before analysis. Rather, each researcher coded the data chunks based the experiences and meanings as stated by the students ([Supplementary Data](#)).²⁶ After coding the same 5 reflection papers, the researchers met to discuss the codes and together established a code book that organized codes into thematic groups and subgroups. The researchers then continued to code the remainder of the reflections, meeting weekly to discuss codes, refine thematic groups/subgroups, and add new thematic groups and subgroups as needed.

Percent agreement was calculated by theme to determine interrater reliability and ranged from 89.4% (group dynamics) to 95.5% (student engagement). Although the proportion agreement method does not take into consideration the possibility that coders might agree occasionally by chance, more complicated methods of calculating interrater reliability (such as Krippendorff's α) were not appropriate here because of the large number of codes, the possibility for multiple codes on a data chunk, and the fact that not all codes had equal probability of being used in each reflection paper.²⁷ Any discrepancies in data chunking, coding, and thematic organizing were discussed by both researchers and resolved. Once analysis was complete, reflections were reidentified with the semester they were from so that cross-semester comparisons could be made.

Informal course evaluation. At the end of each semester, the instructor asked students to provide anonymous course feedback via a multipart evaluation form. First was a series of 12 statements regarding course format and group work that were to be rated using a 5-point Likert scale (strongly disagree = 1; strongly agree = 5). Next were 4 open-ended questions asking students to report what in the course worked well, what could be improved, an evaluation of the quality of one's own work, and whether and how the course was valuable. Along with the reflection papers, the informal course evaluations were used as a means of

reflective observation.

A total of 29 evaluation forms were submitted. Because of absences on the day of the evaluation, 4 students did not complete the form; all absences occurred in F15. To analyze the Likert scale questions, students' ratings for each question were entered into SPSS (version 21, IBM Corporation, New York, NY, 2012). An independent-samples *t* test was performed to determine whether a difference existed in students' ratings between semesters. Levene's test for equality of variances was used to determine whether equal variances could be assumed between groups.²⁸ Significance was determined at $P < .05$.

The course instructor analyzed the open-ended questions and a second researcher not affiliated with the course verified them. Analysis began with verbatim transcription of each student's answers into Excel for Mac (version 14.6.2, Microsoft Corporation, Redmond, WA, 2016). Answers were organized by question and then categorized based on the theme described. For example, answers regarding what worked well in the course focused on the instructor and her teaching methods, assignments, readings and materials, course topics, and scheduling, and these served as themes used to categorize students' answers. Tallies were kept indicating how many students addressed each theme. This process was completed for each semester separately, and the themes, answers, and response frequencies were qualitatively compared between semesters based on a mixed-methods approach.²²

RESULTS

A total of 19 students were enrolled in the F15 course, 79% of whom were women. In S16, 14 students were enrolled in the course, 93% of whom were women. All students across both semesters had at least a bachelor's degree; however, no other demographic information was collected. Within the major, about 80% of students were women, 67% were white, 10% were Hispanic/Latino, 5% were black/African American, 3% were Asian, and 8% were nonresident alien. Across the university, the graduate student population was 71% women, 61% white,

16% Hispanic/Latino, 11% black/African American, 5% Asian, and 6% nonresident alien.

Final Grant Proposals

[Table 1](#) summarizes the reviewers' criteria scores for each grant proposal. Although reviewer A scored grants more generously than did reviewer B, both reviewers agreed that grant 30 (F15) and grant 12 (S16) best met the rubric criteria, whereas grant 27 (S16) was consistently scored the lowest. The remaining 3 grants were scored disparately; reviewer A found that grant 26 (S16) was the best of the 3, whereas reviewer B thought that grants 24 and 30 (both F15) were slightly better.

Criteria and total scores were summed between semesters to provide an aggregate semester score ([Table 1](#)). Although statistical significance could not be determined, aggregate scores suggested that the real-life grants from F15 excelled in the areas of innovation, approach, environment, and presentation. Conversely, S16 grants scored slightly higher on significance. Grants from both semesters were similar in meeting criteria for investigators. Overall, F15 grants earned a better aggregate total score compared with S16 grants (mean summative score of 83 vs 93, respectively).

Reflection Papers

Several themes were identified from students' reflection papers ([Supplementary Data](#)), and students from both semesters stated they learned a lot about the grant process and how to write the individual components of a grant application. However, because of space constraints, the authors present the results for 4 salient themes: student engagement, group dynamics, application of the grant assignment to one's life or career, and benefits of hindsight.

Student engagement. Most students (89% in F15 and 71% in S16) expressed that the grant project engaged them in some way, whether at the behavioral, cognitive, and/or emotional level. Often students in both semesters discussed how they met the instructor's expectations for the assignment, such as reading the required materials,

Table 1. Comparison of Reviewers' Criteria Scores,^a Total Scores, and Rank Order^b for Grant Proposals (n = 6)

Criteria	Reviewer	Grant No. (Semester)						Sum of Scores, by Semester ^c	
		30 (Fall)	12 (Spring)	26 (Spring)	24 (Fall)	25 (Fall)	27 (Spring)	Fall, 2015	Spring, 2016
Significance	A	2	2	2	7	4	8	13	12
	B	4	3	8	9	8	9	21	20
	Mean	3	2.5	5	8	6	8.5	17	16
Investigators	A	2	2	3	1	8	7	11	12
	B	7	4	7	7	7	9	21	20
	Mean	4.5	3	5	4	7.5	8	16	16
Innovation	A	1	1	2	2	1	6	4	9
	B	7	8	8	9	8	9	24	25
	Mean	4	4.5	5	5.5	4.5	7.5	14	17
Approach	A	2	3	1	5	4	8	11	12
	B	2	5	9	8	7	9	17	23
	Mean	2	4	5	6.5	5.5	8.5	14	17.5
Environment	A	1	1	3	2	2	6	5	10
	B	4	5	7	7	7	7	18	19
	Mean	2.5	3	5	4.5	4.5	6.5	11.5	14.5
Presentation	A	1	1	1	1	4	4	6	6
	B	4	3	6	4	7	9	15	18
	Mean	2.5	2	3.5	2.5	5.5	6.5	10.5	12
Total score	A	9	10	12	18	23	39	50	61
	B	28	28	45	44	44	52	116	125
	Mean	18.5	19	28.5	31	33.5	45.5	83	93
Rank order, by total score	A	1	2	3	4	5	6	1, 4, 5	2, 3, 6
	B	1 (tie)	1 (tie)	5	3 (tie)	3 (tie)	6	1, 3, 3	1, 5, 6
	Mean	1	2	3	4	5	6	1, 4, 5	2, 3, 6

^aCriteria scores: 1 = exceptional, 2 = outstanding, 3 = excellent, 4 = very good, 5 = good, 6 = satisfactory, 7 = fair, 8 = marginal, 9 = poor. ^bRankings are in order from best (1) to worst (6) score. ^cBolded summative scores are the better of the 2 semesters.

finding an appropriate grant opportunity, and following the grant application directions. Yet F15 students more frequently reported exerting additional efforts to ensure their grants were feasible and competitive (61% in F15 vs 29% in S16). One F15 student reported:

I contacted the customer service department at both Lowe's and Home Depot stores to ask questions and request more details that were not available on their websites. In addition, I did an excessive search on various other websites ... to compare prices, materials, and brands in order to obtain the best deal available.

The F15 students also mentioned how they sought extra assistance outside class, either from the instructor or from the university's writing center. Still other F15 students described the extra time they devoted to this project. For example,

I really enjoyed searching for grants and because I was enjoying it so much, I found myself spending the better part of a day searching for applicable grants.

Another noted the sacrifice she made to complete her assigned section, stating "I missed 1 review time for another nutrition class to finish the evaluation plan."

Much of this engagement from F15 students was attributed to the grants being real. One student explained, "I thought that having a real group to fund was very helpful and provided inspiration to put in a serious amount of effort." Another mentioned, "As a team, we had to stay focused on the fact that we are seeking real money and this is not accomplished by superficial responses to questions." Still another student said,

In school, most assignments are graded by a professor and are never reviewed by a third party. However, for the ... grant assignment, we had to pay very close attention to our written work and the instructions of the grant.

In fact, nearly three quarters of the F15 students (72%) reflected on how

their efforts had real-life implications for elementary schoolchildren. One noted:

I became more aware of how the Annie's grant would impact the children of [the elementary] school instead of just focusing on the grade I received once this project was completed. ... We, as a group, have come to truly care about [the PTA's] cause and the benefits and opportunities it offers and will continue to offer the students as well.

The S16 students did not make comparable statements, although 2 S16 students wrote about how their proposals could improve the health of others if they were funded.

Group dynamics. Most students (89% in F15 and 79% in S16) reported positive experiences of collaboration, teamwork, and overall functioning within their groups. Students in both semesters described how the varying skills of their group members made the project successful and that group members often helped with others' tasks. It is notable that the term *respect* was mentioned several times in F15 but not S16. For example, "We communicated with each other well and tried to respect everyone's space." Another F15 student shared:

Everyone in my group were so nice; they understood that English is my second language. I had some problems speaking English, so when I had something to say, they usually stopped and listened to me. I felt they respected me.

Conversely, a minority of students in each semester (33% in F15 and 29% in S16) noted some issues within their groups, such as lack of agreement, differences in writing styles and communication techniques, and unilateral decision making. Yet all 6 F15 students who made negative comments still mentioned that their groups worked together and functioned well overall, whereas 3 of the 4 S16 students were consistently negative throughout their reflection. One S16 student explained, "Some of our team members were argumentative and would not listen to each other before

making a decision about the grant proposal." Another S16 student stated, "I feel that in our group, the tasks were sometimes not always understood by the group members and this contributed to this disconnect that had occurred between our entire group." Those 3 S16 students were from the same grant group. Unlike the F15 group members who reported overcoming their issues, the 3 S16 group members were unable to surpass their dysfunction and focus on any positive group attributes.

Application to one's life or career. Half of the students in each semester reflected that the grant assignment would be useful for their future careers and/or community-based work. Within this theme, however, F15 students focused mainly on grant impacts and real-world connections. For instance, 1 F15 student explained, "This grant writing experience has provided me with additional knowledge and tools that I can use to make a real impact in cities in need."

In comparison, students in S16 most frequently reflected on the application of their learning about group dynamics and management. A student said:

As an art director, my team generally collaborates well when we have time to brainstorm on a longer-term project, but as artists, we are very accustomed to working through things individually and then talking through feedback later. Moving into a different world of discussion and collaboration with this project has made me even consider how my design team could possibly blend a little more through finding ways to let strengths emerge ...

Benefit of hindsight. Nearly all students (n = 31) commented on at least 1 component of the grant assignment that they would have done differently if starting again. The majority of these changes across both semesters focused on streamlining the writing process, conducting more research, and devoting more time to the proposal. Within this theme, the main difference in students' reflections across semesters dealt with the desire for

Table 2. Graduate Students' Mean Scores for Likert-Based Informal Evaluation Statements, by Semester

Statement	Semester	n	Mean Score ^a (SD)	t	Degrees of Freedom	P
I find the format of this class helpful to the way I learn.	Fall, 2015	15	4.0 (0.8)	-0.26	27	.80
	Spring, 2016	14	4.1 (0.6)			
I feel that this class format engages my interest.	Fall, 2015	15	3.8 (1.0)	-1.97	27	.59
	Spring, 2016	14	4.4 (0.6)			
I feel comfortable speaking in this class.	Fall, 2015	15	4.4 (0.7)	0.45	27	.65
	Spring, 2016	14	4.3 (0.6)			
I find class discussions help me in understanding the readings.	Fall, 2015	15	4.0 (0.9)	-2.59	27	.02
	Spring, 2016	14	4.7 (0.5)			
I learn more if class discussions are more structured.	Fall, 2015	15	3.8 (0.8)	0.68	27	.50
	Spring, 2016	14	3.6 (1.0)			
I feel that class discussions are dominated by 1 or a few people.	Fall, 2015	15	3.4 (0.8)	0.82	27	.42
	Spring, 2016	14	3.1 (0.9)			
I learn better when I have more of a chance to speak.	Fall, 2015	15	3.3 (0.8)	-0.91	27	.37
	Spring, 2016	14	3.6 (1.0)			
I feel that I learn more when I work with a group.	Fall, 2015	14	3.1 (0.9)	0.34	26	.74
	Spring, 2016	14	3.0 (1.2)			
I feel that I need more guidance for group work.	Fall, 2015	15	3.0 (1.2)	1.43	27	.17
	Spring, 2016	14	2.4 (0.9)			
I find that working in a group confuses me.	Fall, 2015	15	2.5 (1.2)	-0.085	27	.93
	Spring, 2016	14	2.6 (1.2)			
I think that groups work better when each person has an assigned role in the group.	Fall, 2015	15	3.7 (1.1)	-1.42	23.9	.17 ^b
	Spring, 2016	14	4.2 (0.7)			
I think that I would learn better if a different format were used for this class.	Fall, 2015	15	3.5 (0.8)	3.02	27	.006
	Spring, 2016	14	2.4 (1.0)			

^aPossible scores: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree. ^bEqual variances not assumed. Note: Mean scores for each statement were compared between semesters using independent-samples *t* test.

increased clarity and information early on. In the case of F15, 33% of students stated that they would have benefited if specific information from the community partner had been obtained first. One F15 student explained,

Retrospectively, it would have been helpful to know that the teachers play a minor role in the [PTA's] project when determining which grant opportunity to choose from the 15 that my group collected.

In addition, 28% of F15 students would have liked more grant examples, more focused time with the instructor to understand expectations, and a discussion of writing tips before the grant process began.

In comparison, only 21% of S16 students reported that more details about their community and program plan would have been helpful from the beginning. One S16 student stated, "In retrospect, I would have conducted a needs assessment prior to forming a grant proposal." In addition, 36% of S16 students would have liked more examples of completed grants, along with clearer guidelines and expectations from the instructor.

Informal Course Evaluation

Responses to the Likert-based statements were not significantly different between semesters, with 2 exceptions (Table 2). For the statement *I find class discussions help me in understand-*

ing the readings, S16 students had a higher level of agreement compared with F15 students (mean score 4.7 vs 4.0; $t_{27} = -2.59$; $P < .05$). Likewise, S16 students had a higher level of disagreement to the statement *I think I would learn better if a different format were used for this class* compared with F15 students (mean score 2.4 vs 3.5; $t_{27} = 3.02$; $P < .01$).

Table 3 illustrates the 3 most frequently identified themes for each of the 4 open-ended questions, by semester. Overall, the themes expressed were similar across semesters, although the number of statements made within each theme varied. Students in both semesters reported similar feedback on what worked well for them in the course, including aspects of the

Table 3. Most Prevalent Themes in Graduate Students' Responses to Informal Evaluation Open-Ended Questions, by Semester

		Fall, 2015 Semester (n = 15)		Spring, 2016 Semester (n = 14)	
Themes	No.	Illustrative Examples	No.	Illustrative Examples	
Question 1. Please comment on what worked well. What aspects of the course and your professor's teaching are helpful for your learning?					
Professor/teaching methods	5	"I enjoy the aspects of self-studying. Very approachable professor." "Presentations were great, open discussions." "Professor was passionate." "When you explain the purpose/basic concept of the assignment. It's easier to apply it in order in similar ways."	12	"I felt very comfortable speaking in this class and I liked the daily discussions." "I enjoyed the student-led presentations. I would have liked the class to be more about current applications in nutrition than about the grant writing." "I thought the professor asked very engaging questions during group discussions."	
Assignments/group work	4	"I think the assignments help me understand and learn some things." "Picking the assignments for the grant each person wanted to lead."	6	"The groups were very helpful and cooperative." "Having all assignments outlined ahead of time was extremely helpful as well as having parts of the grant due each week."	
Readings/materials	4	"Materials were relevant." "The reading materials are most important stuff to help me."	5	"I thought the readings helped with the grant writing." "The workbook was most helpful! It showed how to develop each step so that we had a model."	
Question 2. Please comment on what could be improved. What specific advice would you give your professor to help you learn better?					
Teaching methods	9	"I believe that the lectures should have involved more questions within the PowerPoint for class discussion on grants."	3	"It still felt disjointed-grant vs. research. I would have liked to read a completed grant and then see the research it funded for a full-circle perspective."	
Assignments/group work	3	"I think more examples of the grant sections would better benefit each group when competing each assignment." "I think the grant project could be explained more clearly." "Less group work."	9	"I thought the grant writing component was not structured enough. The book helped; however, I would have liked more guidance on writing grants. I do not think I will be using any of the grant writing skills in the future." "I feel that the group project could have been improved with more individualized tasks." "The grant portion should be its own course."	
Readings/materials	1	"I believe the book failed to give more examples in grant writing."	1	"I think if the PowerPoints were published on Canvas before the classes, this would be very helpful."	
Question 3. Evaluate the quality of your work in this course. What have you done well? What could you have done to improve your learning?					
I worked hard/I did well	10	"I think I did good in most of the assignments. I learn how to write a grant." "I did well with the readings and the group work. I am not a fan of working in groups especially as part of such a long and large assignment, but I managed." "I gave 100%."	11	"I believe that I did a good job with making sure the grant got done each week as well as proofreading and providing feedback/discussing information with group members." "I felt that I performed well and put in a lot of work. I helped organize the group a lot, so I was never confused."	

(continued)

Table 3. Continued

		Fall, 2015 Semester (n = 15)		Spring, 2016 Semester (n = 14)	
Themes	No.	Illustrative Examples		No.	Illustrative Examples
More effort outside class	3	“Could have put more time into the readings.” “I should have met with the professor outside class for help in group grant project.”		9	“It would be better if I read more before each class.” “I could have done more outside readings about the grant project that may have been confusing or challenging to me.”
More class participation	1	“Possibly having more participation in the class discussions.”		2	“To improve my own learning, I would have possibly taken more of a vocal part in the class discussions.”
Question 4. Has this been a valuable course for you to take? Why or why not?					
Yes, I learned a lot	6	“Yes, I learned how to critically evaluate journal articles and write a grant, which is a huge accomplishment.” “Yes, I learned a lot. I appreciated the way you teach and ask us questions so we can think.”		6	“Yes—I knew nothing about grants at all. I have a much deeper respect for researchers and programming!” “Yes, I have learned how to fully critique nutrition information and trends. I have also gotten valuable experience in writing a grant proposal.”
Yes, relevant to my career	4	“Yes—grant writing and critical article reviews are crucial skills for my future professional success.”		1	“Yes! I am interested in research, so it is important to understand the grant writing process.”
Yes, I enjoyed the course	3	“Yes! Grant writing was fun. Would have preferred more engaging discussions.” “I enjoyed this class due to the interaction and really working toward a goal, knowing that all the work I was doing was for a reason.”		4	“The discussions were the most interesting part of the class. It was interesting to know how the grant process works, but I would like more in class time to work on it with the groups”
Grant writing not relevant to my career	1	“Kind of, yes, because the grant application was kind of unnecessary for me.”		3	“I know in the future I will never write a grant. I think the grant portion would be an elective. It was hard for me to be engaged and stimulated by the grant writing process.”

instructor's teaching methods, assignments and group work, and readings and materials. Likewise, students across semesters noted that they would have benefited from more examples and guidance on grant writing, and the majority mentioned that they put in a lot of effort and did well in the course. Although statistical significance could not be determined, compared with F15, students in S16 made 3 times as many comments stating that they could have put in more effort to prepare for class and/or understand the grant assignment (3 vs 9, respectively). Finally, whereas most students thought the course was valuable, more students in F15 reported that grant writing was important for their future professional success (27% in F15 vs 7% in S16), whereas more students in S16 expressed that they did not think they would ever need to write a grant in the real world (21% in S16 vs 7% in F15).

DISCUSSION

Although previous studies reported the benefits of a service learning approach for coursework centered on grant writing,^{20,29} few studies assessed community-engaged learning in graduate nutrition education.^{3,19} One strength of the current study is that the researchers were able to compare a community-engaged approach to a more traditional learning method, albeit still an experiential learning opportunity, at the graduate level. Based on students' final grant proposals and feedback, it is apparent that students from both semesters experienced academic and personal gains from the grant assignment. Thus, this study suggests that community-engaged approaches and more general experiential opportunities are both effective methods of enhancing student learning.

The integration of experiential learning in the classroom can increase student engagement through the use of real-life projects.

Yet when challenged with writing for an actual community partner com-

pared with a fictitious (although realistic) scenario, students expressed enhanced engagement, improved group dynamics, a better ability to apply the assignment to their life or career, and higher-quality grant proposals. At the graduate level, recommendations for assessment of these academic outcomes have been encouraged when incorporating service learning into curricula.³⁰ In addition, these reported benefits are supported by prior research. For example, in terms of engagement, students from a US private research university who completed service learning courses scored higher in community, academic, and interpersonal engagement scales than did students taking traditional courses.³¹ Service learning was also linked to student engagement such as active and collaborative learning.³² A study among graduate public health students found that service learning courses enhanced personal leadership skills, increased ability to communicate ideas, and helped define career paths.²¹

Regarding group dynamics, students across semesters commented on their positive experiences and struggles with working as a team, although F15 students appeared better able to overcome their challenges compared with S16 students. Other studies showed that service learning courses improved social skills³³ and interpersonal skills.³⁴ In addition, 13 US community colleges awarded service learning grants found that service learning students reported higher scores in teamwork and individual learning than did non-service learning students.³⁵

Service learning can help prepare nutrition students for their future careers through active participation in community-focused projects.

In the current study, F15 students were more inclined than S16 students to discuss postgraduate goals and report on their own community-based activities based on what they learned in the course. Similarly, previous research on nutrition and dietetics

majors showed that exposure to real-life settings can help students find their professional niche.¹² Likewise, with the combination of academics in the classroom and a community partner with whom to interact, students have been shown to grow intellectually and personally.³⁶ Of particular importance, the act of providing service can increase students' sense of civic responsibility and engagement.³³ Other research found that working with community partners during academic coursework can help students contribute to and interact with the public effectively after they have graduated.³⁷ Similarly, after volunteering in a community kitchen to fight hunger, students agreed that they would volunteer and fund raise in the future to help raise awareness regarding food insecurity.³⁸

Finally, F15 grants earned a better aggregate total score compared with S16 grants, reflecting higher overall quality. This may be because F15 students felt more inspired or obligated to produce a thoughtful, coherent, and feasible grant proposal knowing it would go to the PTA and, if funded, would benefit hundreds of elementary-aged children. Prior studies showed similar improvements in cognitive learning outcomes. For example, students who became instruction writers within their school library as a service learning project wrote better because they understood the course content, as opposed to before project implementation.³⁹ Similarly, students enrolled in a service learning course outperformed non-service learning students on midterm and take-home final essays, illustrating their improved understanding of course content.⁴⁰ Still, in the current study, 2 of the 3 S16 grants were rated relatively high, indicating that most students learned the grant writing concepts regardless of the semester in which they were enrolled.

This study had limitations. The data sources were not originally collected for research purposes, and students were not evaluated on their depth of learning and engagement. Future studies would benefit from more direct measures of these outcomes (see, for example, the compiled volume of service learning research scales by Bringle et al⁴¹). Likewise, students were not randomized into fall and spring

semesters, and class sizes were small (19 and 14 students, respectively), so statistical findings should be interpreted with caution. Also, 1 of the researchers who conducted the qualitative coding was the course instructor. Although efforts were taken to reduce bias (use of a second coder, anonymous and typed reflection papers and informal evaluations, and ≥ 1 year of time between the course and the current study), there may still have been bias unaccounted for in the methods. In addition, this study was based on 1 course taught by 1 instructor at a single public university; thus, it is possible that the findings are unique or contextual. However, given the positive outcomes of community-engaged learning noted by prior studies in different locations and times,^{8,15,16} it is unlikely that these findings are circumstantial.

Finally, as is natural in teaching a course over time, slight changes in emphasis were made to the S16 course as a result of student feedback and observation in F15. Most notably, the instructor focused more closely on writing the need and significance section, and distributed a workbook that provided examples of grant application sections. These changes could have led to differences in how grants were written and what students needed in terms of additional assistance. For example, S16 grants scored slightly higher in the area of significance, which could be attributed to the increased focus on statements of need and significance in class. However, F15 grants still scored higher in such criteria as approach (which covered various grant application sections including methodology, evaluation plan, and budget), even though S16 students received examples of grant proposals in their grant workbook. Similarly, S16 students were more likely than were F15 students to indicate that they would have liked to receive additional examples of completed grants and clearer guidelines. Although the changes made to the course between semesters were a limitation of this comparative study, the findings suggest that if the changes were paired with the community-engaged component, outcomes may have been even more pronounced.

IMPLICATIONS FOR RESEARCH AND PRACTICE

Service learning is heterogeneous in both nature and delivery, and faculty have the ability to customize community-engaged experiences that complement and enhance current curriculum and course objectives. Yet implementing community-engaged experiences remains challenging at all levels of higher education, and particular obstacles exist at the graduate level, including unsupportive institutional and faculty culture, lack of educational outcome assessments, and complexities with embedding community engagement into all disciplines.³⁰ Such pedagogy can also conflict with graduate students' employment and family responsibilities if it requires additional time outside the classroom.

The community-engaged learning experience analyzed in this study provides 1 model that addresses these challenges without sacrificing learning outcomes for students. The outcomes of this research will establish more defined criteria on the success of service learning strategies. For example, instructors should include domains such as student engagement and career applicability in future instruments that assess the impact of community-engaged learning. Future research and practice could hone this model or introduce new ones. For example, community-engaged learning does not have to be limited to the semester in which students are enrolled. In fact, after the conclusion of the F15 semester, 1 grant was funded and a student coauthor implemented the grant to fulfill her 90 hours of practicum requirements. Even after she satisfied the hours, this student completed most of the final grant report required by the funder. As a result, she was able to experience the entire grant process from inception to completion, something that a single graduate course could not provide. Similar cross-course or multi-semester projects could benefit students in all subject areas, as well as provide a valuable service and longer-term commitment to community partners. This is especially noteworthy because many graduate students are becoming

more diverse in their field and studying ≥ 1 field at a time.³⁰

Finally, it may not always be possible for an instructor to find a suitable community partner, as was the case in S16. In such situations, this study indicates that fictitious, yet realistic, experiential assignments can provide many of the same learning outcomes gained from community-engaged projects. Future studies can identify the important elements to include in mock scenarios that enrich student learning outcomes in a manner similar to real-life experiences.

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SUPPLEMENTARY DATA

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