

Impact of a Service Learning Based Community Nutrition Course on Students' Nutrition Teaching Self Efficacy

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Abstract

Nutrition education is an important component of public health prevention and nutrition educators need to be adequately trained to build self-efficacy (SE) in teaching. Service-learning (SL) is a pedagogy that combines academic learning with service in the community, making it an ideal framework for undergraduate institutions to prepare students to be nutrition educators. In order to test the hypothesis that a SL course increases students' SE in teaching nutrition in the community, researchers developed the SET-NC survey and administered it to students enrolled in a Community Nutrition course (experimental group) and a Public Health Nutrition course (control group). Results indicate that there was a significant increase in SE over the course of the semester in the experimental group but not in the control group. Therefore, this SL course increased future nutrition educators' SE in teaching nutrition in the community and the course design may provide insight into the development of future SL courses designed to increase students' SE in teaching health and science in the community. Additionally, future validation of the SET-NC survey may result in a useful tool for instructors seeking to measure students' SE in teaching nutrition in the community.

Introduction

Service-Learning (SL), an educational pedagogy that combines academic material, relevant service and critical reflection (Ash and Clayton 2004), is not new to science disciplines. In fact, within the discipline of nutrition, SL is commonly used in community nutrition courses, due to the nature of the subject material (Kessler et al., 2011; Pierce et al., 2012). The purpose of community nutrition courses is to provide undergraduates with the fundamentals of designing, implement-

ing and evaluating community programs, which includes helping build their skills in providing nutrition education to diverse populations. Undergraduates may provide nutrition education to community participants in a variety of venues, including public schools, churches, after school programs and community centers. In this context, the goals of nutrition education outreach are two-fold: (1) to provide quality evidence-based nutrition education to community participants of diverse ethnic and socio-economic backgrounds and (2) to provide students with opportunities to synthesize and apply academic concepts through teaching others. In order to provide quality nutrition education programs in the community, undergraduates need to be trained in best practices of teaching to aid in skill building. Critical reflection can facilitate this skill building.

Critical reflection, a key component of SL, allows undergraduate students to expand/enhance learning in the areas of personal growth, civic learning and academic enhancement (Ash and Clayton 2004, 2009). Personal growth reflection can fuel students' growth as nutrition educators, civic learning reflection allows for critical analysis of the effectiveness of nutrition education programs and academic enhancement reflection enables students to see how their discipline specific coursework can be taught in the community.

Self-Efficacy (SE) is one area of personal growth and awareness, which Bandura (1997) describes as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments." The cyclical model of teaching self-efficacy presented by Tschannen-Moran et al. (1998) can be applied to the SE of undergraduate students ("student teachers") teaching nutrition education programs in the community as part of an SL course. This model combines Bandura's four

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sources of efficacy expectations: mastery experiences (in which the student teacher masters a technique), physiological/emotional arousal (the current state of body and mind of the student teacher), vicarious experiences (watching others perform similar duties) and verbal persuasion (including pep-talks from supervisors) with what they call performance feedback. This information is then interpreted by the student teacher through cognitive processing, allowing her to judge competence in the task at hand and inform future efficacy information. Therefore, it is important for undergraduate instructors, who are training nutrition educators ("student teachers"), to understand the contributors to SE in order to provide their students with a supportive environment to build skills and SE.

High SE is important because educators (i.e. nutrition student teachers) with higher SE are more effective and their students (i.e. community participants) have higher SE related to the course content (e.g. nutrition) (Bruning et al., 2011). Educators with higher SE are also more open to new ideas, organized and likely to plan, enthusiastic about the subject matter and likely to expend effort in teaching (Tschannen-Moran et al., 1998). However, educators with low SE also run the risk of creating a self-fulfilling prophesy of not succeeding as educators (Tschannen-Moran & Woolfolk Hoy, 2007). When facing nutrition-related public health concerns, the health professions need nutrition educators who are creative, organized and enthusiastic about health and nutrition.

One way to increase future nutrition educators' SE is to provide opportunities for mastery experiences. Experience providing nutrition education has been shown to significantly increase future health educators' SE in teaching the topic and their willingness to teach it in the future (Fahlman et al., 2011). Professional development (i.e. guided skills-based training) has also been shown to improve performance; however, time spent teaching nutrition has a more significant effect on performance (Fahlman et al., 2011). Therefore, nutrition undergraduates should be given opportunities to gain experiences teaching nutrition in the community (i.e. through SL) while also receiving guided instruction from experienced nutrition educators (i.e. undergraduate instructors).

Two of the authors developed a SL Community Nutrition course consisting of two parts: (1) pre-service-learning nutrition education training and (2) service-learning experience where students teach an established nutrition education program in the community. Over the course of four years, the researchers have conducted focus group discussions, analyzed students' critical reflection papers and had conversations with students to improve the course. Through this evaluative process, the researchers believe that the SL course increases students' SE in teaching nutrition in the community. Therefore, researchers sought to quantitatively test the hypothesis that a SL Community Nutrition course increases undergraduate nutrition students' SE in teaching nutrition in the community.

Methods

Study Design

In order to assess students' SE in teaching nutrition education in the community, researchers developed a community nutrition teaching SE survey and administered it to two groups of students: an experimental group of students in an SL course (n = 20) and a control group of students not in the SL course (n = 63). Researchers administered the survey to students at three time points: (1) beginning of the semester, (2) midterm and (3) end of the semester. Researchers then analyzed the data to determine the effect of the SL course on students' SE in teaching nutrition in the community. All study protocols were approved by North Carolina State University's Institutional Review Board.

Participants and Recruitment

Participants were students enrolled in an upper-level nutrition course, either Community Nutrition (experimental group) or Public Health Nutrition (control group). Both courses require an introductory nutrition course as a pre-requisite and students in Community Nutrition must be Nutrition majors or minors. Both courses serve as a nutrition elective for Nutrition majors and minors. Researchers chose the students in Public Health Nutrition course as a control group because the content covered in the two courses is similar with the major difference between the two courses being the service-learning component. The control group was also used to ensure that the Community Nutrition students' self-efficacy was not increasing over time merely due to increase in knowledge or outside experiences (e.g. volunteer experiences). All 20 Community Nutrition students completed the survey at all three time points and 38 of the 63 students (60.3%) enrolled in Public Health Nutrition completed the survey at all three time points. Students who did not complete all three time points and students who were enrolled in both Community Nutrition and Public Health Nutrition were excluded from the control group.

Course Design

Community Nutrition is a SL course that consisted of a 3-hour lecture and a 4-hour lab. In the lecture, students learned about nutrition program development, implementation and evaluation as well as cultural foods and nutrition policy. The corresponding lab was composed of two parts: pre-SL training and the SL experience. During the 6-week pre-SL training, students prepared to teach an established cooking and nutrition education program in the community by learning key skills needed to be a successful nutrition educator (lesson planning, knife skills, facilitated dialogue and best practices in teaching). The course instructors assigned students to groups of five, with each student having a unique teaching role. During the 6-week SL experience, students taught an established nutrition education program (Cooking Matters, 2013) to kids, teens, or senior adults at local community partner sites.

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Throughout the semester, the instructors purposefully provided students with activities and assignments to increase their SE as nutrition educators, which can be classified into Bandura's four sources of efficacy expectations: vicarious experiences, mastery experiences, verbal persuasion and physiological/emotional arousal. The instructors provided students with vicarious experiences through a best practices video and real-time evaluation of peers. At the beginning of the training experience, students watched a best practices video featuring former Community Nutrition students and the instructors guided students to use their critical thinking skills to evaluate the video clips as the group discussed effective teaching strategies and areas for improvement. Students also observed their peers in "real-time" and evaluated their performance of three mock lessons: (1) teaching knife skills, (2) an individually taught 10-minute lesson and (3) a group taught 60-minute lesson. The course design facilitated the process of students mastering teaching skills in an incremental fashion. First, they practiced teaching knife skills to their peers. Next, they taught a 10-minute lesson (alone) to their peers while their peers act like community participants. Finally, having mastered teaching alone, they taught a 60-minute lesson (in a group), once again having peers act as community participants as well as some guest participants. Throughout the semester, students received verbal persuasion (feedback) from both their peers and the instructors, giving students an opportunity to discover their strengths and weaknesses. The instructors also sought to help students maintain a positive emotional state by creating a supportive environment of sustainable community partners, an open-door policy for instructors and support from a peer teaching assistant/community liaison.

Instrument Development

Researchers searched the literature for a teaching SE survey related to skills needed to teach nutrition in the community. Not finding a SE survey that mirrored skills taught in the Community Nutrition SL course, researchers developed the Self-Efficacy in Teaching Nutrition in the Community (SET-NC) survey. Researchers developed the SET-NC, creating items by adapting survey questions from the Nutrition-Teaching Self Efficacy Scale (Brenowitz and Tuttle, 2003), General Self-Efficacy Scale (Imam, 2007) and the College Teaching Self-Efficacy Scale (Prieto, 2005). Researchers also used personal experience teaching the Community Nutrition SL course

and observing students teaching in the community to develop questions. The initial pool of survey items consisted of 65 items and after editing for redundancy, the 35-item SET-NC was the result. Items span the topics of problem solving, specific teaching abilities and extent of nutrition knowledge needed to teach basic nutrition topics in the community. A full list of questions can be found in Table 1. The SET-NC is measured on a 5-point Likert scale (Strongly Disagree to Strongly Agree) with scores ranging from 35 to 175. Two items are negatively coded and must be reverse coded.

Data Collection

Researchers administered the SET-NC to the experimental and control groups at three points in the semester: (1) the beginning of the semester (before pre-SL training), (2) midterm (after the pre-SL training and before the SL experience) and (3) the end of the semester (after the SL experience).

Table 1: Self-Efficacy in Teaching Nutrition in the Community (SET-NC) Questions

1	I can be flexible in my teaching even if I must alter my plans.
2	I can adapt to the needs of my students (motivation, interest, prior knowledge, etc.) when planning nutrition lessons to be taught in the community.
3	I have the ability to persist when community participants have difficulty with a concept when teaching nutrition in the community.
4	I have the ability to explain nutrition concepts at an age appropriate level when teaching nutrition in the community.
5	I have the ability to ask age appropriate questions when teaching nutrition in the community.
6	I can control disruptive behavior when teaching nutrition in the community.
7	If a community participant in my class becomes disruptive and noisy, I feel assured that I know some techniques to redirect him/her quickly.
8	I can promote student participation when teaching nutrition in the community.
9	I have the ability to maintain the attention of community participants when teaching nutrition in the community.
10	If a community participant did not remember information I gave in a previous lesson, I would know how to increase his/her retention in the next lesson.
11	I can gauge community participants' comprehension of what I have taught when teaching nutrition in the community.
12	When I am confronted with a problem, I can usually think of a solution when teaching in the community.
13	I can calmly handle any problems that may arise when teaching nutrition in the community.
14	I feel insecure about my ability to teach nutrition in the community.*
15	I can speak clearly and understandably when teaching nutrition in the community.
16	My teaching training program and/or experiences have not given me the necessary skills to be an effective nutrition educator.*
17	I can provide an alternate explanation or example when community participants are confused.
18	I have adequate training to teach nutrition in the community.
19	I have the skills necessary to teach nutrition concepts effectively to people in the community.
20	I can create a positive classroom climate for learning when teaching nutrition in the community.
21	I can encourage community participants to ask questions during class.
22	I have the ability to show enthusiasm when teaching nutrition in the community.
23	I can reflect on my teaching practice with the aim of making appropriate improvements when teaching nutrition in the community.
24	I can use information derived from my own self-reflection to improve my teaching in the community.
25	I can remain calm when facing difficulties when teaching nutrition in the community.
26	I can select the appropriate materials for each class when teaching nutrition in the community.
27	I can solve most problems if I invest the necessary effort when teaching nutrition in the community.
28	I can spend the time necessary to plan for teaching nutrition in the community.
29	I know how to handle unforeseen situations when teaching nutrition in the community.
30	I can usually handle whatever comes my way when teaching nutrition in the community.
31	I can update my knowledge of the subject I am teaching in the community.
32	I understand nutrition concepts well enough to teach them to people in the community.
33	I can answer people in the community's nutrition related questions.
34	I have the ability to use appropriate teaching materials and aids when teaching nutrition in the community.
35	I have the ability to use appropriate activities and experience when teaching nutrition in the community.

*reverse-coded questions

Data Analysis

Researchers entered the data into SPSS-21 software, using only data from students who completed all three time points. In order to obtain a composite score for each student, the negatively coded items were reverse-coded and then the responses to the 35 items were summed. Researchers conducted a repeated measures analysis of covariance (RM ANCOVA) with the time 1 SET-NC score as a covariate, the within-subject factor being occasion (corresponding to time 2 and time 3 SET-NC scores) and the between-subject factor being group (experimental or control). Independent-samples t-tests were also conducted to compare SET-NC scores of the experimental group and the control group at the three time points. Statistical significance was determined at $p < 0.05$.

Results and Discussion

An independent-samples t-test was conducted to compare SET-NC scores of the experimental group and control group at time 1. Results indicated that at baseline, students in the experimental group ($\mu=144.50$, $\sigma=13.86$) scored significantly higher than students in the control group ($\mu=133.4$, $\sigma=13.67$); $t=-2.10$, $p=0.04$. Therefore, time 1 was used as a covariant for the RM ANCOVA analysis.

Results of the RM ANCOVA indicated significant main effects for group $F(1,2142.73)=21.09$, $p<.001$ and the interaction between occasion and group $F(1,381.47)=5.25$, $p=.026$. There was not a significant main effect for occasion. Decomposing the interaction, results indicated the experimental group had significantly higher SE scores than the control group at both time 2 ($p=0.008$) and time 3 ($p<0.001$). Follow-up independent-samples t-tests of SET-NC scores of the two groups at time 2 indicated that students in the experimental group ($\mu=143.35$, $\sigma=13.05$) scored significantly higher than students in the control group ($\mu=128.72$, $\sigma=15.52$); $t=-3.57$, $p=0.001$. A similar follow-up independent-samples t-test at time 3 indicated that students in the experimental group ($\mu=153.60$, $\sigma=16.40$) scored significantly higher than students in the control group ($\mu=131.17$, $\sigma=13.12$); $t=-5.60$, $p<0.001$. Within the experimental group, students scored significantly higher at time 3 than time 2 ($p<0.001$) but there was no significant differences in the control group over this time period.

Researchers hypothesized that the SL course would have a significant impact on students' SE in teaching nutrition in the community. Results indicated that the hypothesis was correct. Community Nutrition students' SET-NC scores increased significantly over the course of the semester, indicating that participating in a SL course positively impacted students' SE. Because the control group students' scores did not change significantly over time, merely being enrolled in an upper-level nutrition course related to public health does not significantly increase SE. Therefore, the effects seen in the experimental group can be attributed to the

information learned and experiences gained from the SL experience.

Students who enroll in Community Nutrition may be different from those who enrolled in Public Health Nutrition. Community Nutrition students' SE was significantly higher than Public Health Nutrition students' SE at the beginning of the semester, possibly due to previous teaching experiences. Another reason for this initial difference in SE may be due to the factors that motivate students to sign up for the SL class. Student teachers who begin teaching with higher SE are more likely to motivate themselves and perpetuate a higher SE (Tschannen-Moran et al., 2011); therefore, students who seek to become nutrition educators may be more motivated to maintain this SE over time. Personal interest and future career plans may also have motivated students to build their community nutrition teaching skills. However, optimistic student teachers' SE tends to decrease as they discover they do not have the skills they need to effectively teach (Tschannen-Moran et al., 1998). Therefore, it is important to build an educational environment that helps all students' SE increase, even when difficulties may arise.

In light of these results, the course design may provide insight into how key components of the Community Nutrition SL course may contribute to students' increase in SE over the course of the semester through vicarious learning, verbal persuasion, mastery and physiological/emotional arousal.

Vicarious Learning

Through a best practices video and real-time evaluation of peers, the instructors provided students with opportunities for vicarious learning early in the semester. There is evidence to support the merits of vicarious learning (Hagen et al., 1998); however, other studies have shown it is not a significant contributor to SE (Tschannen-Moran and Hoy, 2007). Therefore, providing vicarious experiences may be beneficial but may not replace actual teaching experience like that gained from a SL experience.

Verbal Persuasion

After students had learned vicariously from previous Community Nutrition students and their peers, the instructors verbally persuaded students through constructive criticism, highlighting both strengths and weaknesses with the ultimate goal of increasing SE. It is important for students to receive verbal persuasion that provides them with an opportunity to grow; otherwise they run the risk of decreasing their SE and giving up on teaching (Tschannen-Moran et al., 1998). This feedback should also be given frequently and be specific (Margolis and McCabe, 2006). Additionally, professional development is a contributor to teaching SE; therefore, quality of instruction (and feedback) is important in building more efficacious student teachers (Tschannen-Moran et al., 2011).

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Mastery

While verbal persuasion and vicarious experiences are important contributors to SE, the most influential source of efficacy information is mastery experience (Tschannen-Moran et al., 2007). The instructors designed the SL course to provide nutrition undergraduates the opportunity to master community nutrition teaching skills, and the combination of verbal persuasion through constructive criticism and incremental practice allowed most students to master the skills needed to be effective nutrition educators. Through constructive criticism from both peers and instructors and weekly critical reflection sessions during the SL experience, students' SE significantly improved by the end of the semester.

Critical reflection plays a key role in facilitating verbal persuasion and controlling physiological/emotional arousal, but it also mitigates the cognitive processing that turns efficacy information into analysis of the task and assessment of personal performance. Ash et al. (2009) describe a model by which students can reflect on their experience in the community and instructors can guide student learning. In the Community Nutrition course, the instructors fostered an atmosphere of self-reflection by facilitating reflection sessions during the SL experience and having students write a critical reflection paper at the completion of the semester. Therefore, instructors who wish to provide SL experiences for students should incorporate critical reflection so students are in the practice of evaluating their abilities and their limitations.

Physiological/Emotional Arousal

Finally, physiological/emotional arousal plays a role in building SE. students' state of mind and the context in which they teach influence the development of their SE. The instructors spent the last five years developing sustainable partnerships with community partners who believe providing the nutrition education program is a mutually beneficial process. The teaching environment is a key contributor to teaching SE, especially for novice teachers (Tschannen-Moran et al., 2007). Knowing that even under near "perfect" conditions, conflict and surprises may arise, the instructors identified peer teaching assistants/community liaisons to aid in times of conflict and assist with immediate peer feedback. Building this framework for a "low stakes" first teaching experience in the community, the instructors gave students emotional support to foster increases in SE. Through weekly critical reflection sessions, the instructors also gave students a chance to voice their concerns and triumphs and gain both peer and instructor feedback on how to respond to similar situations in the future. The instructors also met with students to resolve group and individual conflicts on an as-needed basis, knowing that students need social support while developing their skills.

This research provides significant evidence for beneficial student outcomes from a SL course. Students need to be provided "low-stakes" opportunities for mastery of teaching skills in order to build their efficacy in

nutrition education. This training model can be adapted to involve any life science education program, allowing instructors at undergraduate institutions the opportunity to prepare their students to be effective community educators.

Limitations

There are limitations to the research, including that the sample was of students at one university. Students enrolled in this university may be different from students at other universities. Therefore, these findings may not be generalizable to the population of nutrition undergraduates as a whole. Additionally, there may have been a social desirability response where students may have believed that their SET-NC scores should have increased over time, causing them to artificially inflate their responses.

Summary

Results indicate that the Community Nutrition course, a SL course, significantly increased students' SE in teaching nutrition in the community. Undergraduate institutions can use the course design as a framework to develop similar life sciences courses aimed at increasing students' SE through verbal persuasion through feedback, vicarious experiences, low-stakes experiences to achieve mastery and a supportive environment to foster increases in SE.

Future research could involve the validation of the SET-NC through administration in undergraduate nutrition programs nationwide. After validation, the SET-NC could be a useful tool in measuring the effectiveness of undergraduate nutrition programs in preparing students to teach nutrition in the community.

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