

INSTRUCTIONAL DESIGN AND ASSESSMENT

A Service Learning Program in Providing Nutrition Education to Children

Rebecca A. Falter, PharmD,^a Karla Pignotti-Dumas, BS,^b Sarah J. Popish, PharmD,^{a*}

Heather M.W. Petrelli, MA,^{a*} Mark A. Best, MD, MBA, MPH,^a and Julie J. Wilkinson, PharmD, MS^a

^aLake Erie College of Osteopathic Medicine

^bFood and Nutrition Services, Sarasota District Schools, Florida

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Objective. To implement a service learning program in nutrition and assess its impact on pharmacy students' communication skills and professionalism and elementary school children's knowledge of nutrition concepts.

Design. First-year pharmacy students completed 4 nutrition education sessions led by a registered dietitian and then presented the material to pre-selected classes of at-risk elementary school children in kindergarten through third grade.

Assessment. Ninety-six pharmacy students completed the pre- and post-experience survey and more than 90% rated achievement of course objectives as strongly agree or agree. Four hundred sixty-eight elementary students completed a pre- and posttest on nutrition knowledge. Significant improvement was found in all grade levels on the knowledge test.

Conclusion. This service learning experience was beneficial for the elementary school children and pharmacy students, enhancing the knowledge of both groups and establishing a positive relationship between the pharmacy school and the community.

Keywords: nutrition, service learning, community, pediatric

INTRODUCTION

The Centers for Disease Control and Prevention (CDC) defines childhood obesity as a body mass index (BMI) of greater than or equal to the 95th percentile on growth charts that are age and sex specific. A child is considered to be overweight if their BMI is greater than or equal to the 85th percentile, but less than the 95th percentile.¹ Obesity has increased from 6.5% to 19.6% in children ages 6-11 years old over the last 30 yrs.² Almost 70% of "obese adolescents grow up to become obese adults." Thus, these children are at a higher risk for developing cardiovascular diseases during their adult years.³ Childhood obesity can lead to adolescent disease states such as hyperlipidemia, hypertension, glucose intolerance or type II diabetes, asthma, and sleep apnea.^{4,5} Seventy percent of obese children in one study had at least one additional cardiovascular risk factor, and close to 40% had 2 or more risk factors.⁶ Having a poor health lifestyle is more

prevalent in families of lower socioeconomic status.⁷ Also, the Centers for Disease Control and Prevention (CDC) recently reported that "substantial racial/ethnic disparities exist, with Hispanic boys and non-Hispanic black girls disproportionately affected by obesity."⁸

School nutrition programs are effective tools for preventing childhood obesity⁹ in the United States as well as in other parts of the world. A school-based intervention in Spain reported a 62% decrease in the prevalence of overweight children during a 2-year prospective study.¹⁰ Providing nutrition education for economically underprivileged elementary students contributes to the Healthy People 2010 goal of reducing overweight and obesity among children and adolescents.⁷ The objectives for Healthy People 2020 also provide more specific goals that incorporate reducing the consumption of calories from solid fats and added sugars.¹¹

The implementation of community service programs within health professions schools could play a role in reducing childhood obesity. The University of Colorado developed a required 1-credit service-learning course, in which first-year pharmacy students went out into elementary school classrooms and taught lessons focusing on "healthy nutrition and physical activity."¹² In 2008, Xavier University of Louisiana provided a 2-credit service-learning course for first-year pharmacy students where

Corresponding Author: Rebecca A. Falter, Shenandoah University, 45085 University Drive, Suite 201, Ashburn, VA 20147. Phone: 703-726-8560. Fax: 703-726-3558. Email: rfalter@su.edu

*Author's affiliation at the time of the study. Dr. Popish's current affiliation is with US Department of Veterans Affairs-VISN 21, Vallejo, CA. Ms. Petrelli's current affiliation is with the University of South Florida.

basic nutrition information was provided to middle school students.¹³ The University of Louisiana at Monroe incorporated a similar service-learning experience into their introductory pharmacy practice experience (IPPE) program.¹⁴

In 2008, the Lake Erie College of Osteopathic Medicine (LECOM) School of Pharmacy entered into a partnership with the Sarasota County Schools Food and Nutrition Services to provide basic nutrition education for elementary students by training pharmacy students and sending them to several local elementary schools. This service-learning program was developed to satisfy the curricular outcomes developed by the school's curriculum committee when the branch campus opened in fall 2007. The program plays an integral role in the curriculum by supporting the 2007 Accreditation Council for Pharmacy Education (ACPE) Standards, Guidelines 2.0, for curricular design to include Standard 9, Guideline 9.1, which states, "the curriculum addresses patient safety, cultural appreciation, health literacy, health care disparities, and competencies needed to work as a member of or on an interprofessional team" and Standard 12 in which students must be able to "promote health improvement, wellness, and disease prevention in cooperation with patients, communities, at-risk populations, and other members of an interprofessional team of health care providers."¹⁵ It also supports the Center for Advancement of Pharmacy Education (CAPE) outcomes for schools to engage students in promoting health improvement and wellness among at-risk populations in an interprofessional manner.¹⁶

The current study assessed the benefit of this program for the Sarasota County elementary schools as well as for our pharmacy students during the 2009 spring semester. The primary objective was to assess the efficacy of the service-learning program with regards to increasing children's knowledge of nutrition concepts. The secondary objective was to determine if pharmacy students perceived an improvement in their own communication skills and professionalism through their involvement in the service-learning program. The pharmacy student educational outcomes and objectives for this course, specific to the service-learning program, can be found in Table 1.

DESIGN

Content Organization and Preparation

The service-learning program, titled "Kids Eat Healthy," is conducted in the second semester of the first year of the pharmacy curriculum as part of the required 2-credit Pharmacist Provided Care course. The project was well-planned with a simple curriculum that would allow students to serve, educate, and care for members of the community in a relatively low-risk setting. The nutrition

Table 1. Educational Outcomes and Course Objectives for a Service Learning Program on Nutrition

Responsible care givers who are advocates for health improvement and are accountable for positive patient outcomes
Students should be able to employ different techniques to attempt to motivate individuals to change or adopt healthy lifestyle habits
Professionals who strive for continuous growth and improvement of personal attitudes, skills, and knowledge
Students should be able to promote the profession of pharmacy as a caring and responsible profession through their service learning experience
Team members who promote open communication to create and maintain a dynamic relationship with patients and interdisciplinary colleagues
Students should be able to interact with individuals of a different race, socioeconomic status, culture and gender with appropriate skills, compassion and desire to understand and value their perspective

information in the course is basic but important for the students to learn and allows them an avenue to provide care at a point in the curriculum when drug knowledge is minimal.

One faculty member from the school of pharmacy coordinated the service-learning project in collaboration with a registered dietitian with the Sarasota County Schools Food and Nutrition Services. The registered dietitian organized the logistics for the project, identified the 3 schools and specific classes that would receive the presentations, and created an assignment schedule. The 3 schools were chosen based on the relatively high number of students at those schools who received free or reduced priced lunches compared to that number at other schools in the district. This was done to target lower socioeconomic students who are believed to be at higher risk of becoming overweight or obese.

Development, implementation, delivery, and assessment of this project required approximately 80 hours of the faculty and dietitian's time in addition to the time invested by the dietitian in instruction.

Pharmacy Student Training

The registered dietitian developed and presented weekly nutrition lectures to students at the pharmacy school. After each of the 4 presentations, she gave the lesson plans for presenting the material to elementary school children to the pharmacy students. The first lecture delivered to the pharmacy students reviewed the purpose of the service-learning experience, the basics of the food pyramid, and serving sizes appropriate for each food group. The second lecture focused on balance and portion

sizes, and the breakdown of nutrition labels. The third lecture covered healthy snacking, diabetes basics, and examples of healthy snacks and portion sizes; pharmacy students also completed a fast-food worksheet in which they had to calculate the total calories and fat contained in their favorite fast-food meal. The final lecture introduced the “go, slow, and whoa foods”¹⁷ guidelines for grocery shopping, and facts about organic foods. In addition to the lesson content, pharmacy students were trained in how to best interact with young children in a classroom setting. Through a coordinated effort with the instructor of the Effective Communications course in which the pharmacy students also were enrolled, students received a 2-hour lecture on the developmental levels of children, different teaching methodologies, and best practices for communicating with children.

The nutrition lessons taught by the registered dietitian and the communication lectures used the first 4 stages of Bloom’s Taxonomy: knowledge, comprehension, application, and analysis.¹⁸ The comprehension stage was addressed through assignments and examinations designed to ensure that retention of knowledge was achieved by the pharmacy students. The application stage was accomplished by the students teaching the nutrition lesson plans in the elementary schools, where the students were able to apply the knowledge that was taught in the classroom. The analysis stage was accomplished through students’ pre- and post-experience reflections, which were incorporated into the required course assignments. The reflections asked the students questions such as, “How as a future pharmacist do you envision yourself promoting healthy behaviors in your patients?” and “Do you think you had an impact on the elementary school students, and what impact did the elementary school students have on you?”

Implementation in Elementary Schools

On the days of the student presentations in the schools, one or more faculty members and the registered dietitian served as liaisons between the pharmacy students and the assigned school. Two to 3 pharmacy students were assigned to each of the selected kindergarten through third grade classes. Using visual aids, educational videos, games, homework sheets, and a food tasting experience (Table 2), the students presented the nutrition lessons in 30-minute sessions, once a week for 4 weeks. The students returned to the same class each week to allow them to build a rapport with the children.

EVALUATION AND ASSESSMENT

Pharmacy Student Survey

At the beginning of the service-learning experience, a pre-experience survey instrument was administered to

Table 2. Steps for Conducting a Taste Testing Lesson With Elementary School Children

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- (1) Hand out taste testing forms and explain directions to each child. Explain that we will taste each item together, and after you taste the food, circle either “thumbs up,” “thumbs down,” or “thumbs to the side.”
 - (2) Hand out the plates to each child with one piece of food on each plate, and a little Light Ranch dressing.
 - (3) Go through the foods and bring visuals of the foods the kids are eating: cucumber, yellow squash, broccoli, carrots, and whole grain crackers.
 - (4) Determine the class favorite food and tell the kids all of these foods can be purchased at the grocery store.
 - (5) Remind the students to choose most foods from the outside part of the grocery store and only some foods from the inside aisles.
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the pharmacy students to measure their perceived attitudes, skills, and knowledge. The same survey instrument was administered at the end of the experience to measure the program outcomes. Part one was a 7-question instrument designed by the pharmacy faculty members and used a 5-point Likert scale ranging from strongly agree to strongly disagree. Statements such as “I am comfortable talking with children between the ages of 5 and 8,” and “I believe that I will have/had a significant impact on elementary students through the ‘Kids Eat Healthy’ program” were asked. Part two was a 14-question instrument, which used a 3-point Likert scale ranging from “quite a lot” to “not at all.” Students were asked to rate their perceived improvement on statements relating to knowledge, skills, and attitudes.

Participation in the survey was a required component of the course, and credit was given for completion. The surveys were administered online via SurveyMonkey.com (SurveyMonkey, PaloAlto, CA), which allowed students’ responses to remain anonymous. The research protocol was submitted to LECOM’s Institutional Review Board and approved under exempt status.

The Mann-Whitney rank sum test was used to evaluate the difference between the pre- and post-experience survey scores. Data were entered into SigmaStat 3.0 (Aspire Software International, Ashburn, VA) for statistical analysis. A *p* of less than 0.05 was considered significant.

Ninety-six pharmacy students completed the pre- and post-experience survey instruments. The results are presented in Tables 3 and 4. On part I of the post-experience survey, greater than 90% of students agreed or strongly agreed that they had achieved the specific objectives for the activity. Among the general professional skills assessed, students rated “feeling a sense of community responsibility” and “taking responsibility as a healthcare

provider” the highest. Students’ scores on items related to skills sets and community service were significantly higher on the post-experience survey, while scores on items related to students’ belief systems did not change significantly. On part II of the survey, students’ scores on items relating to talking with sick people or those of different cultures, interacting with difficult people, and showing empathy were significant between pre- and post-experiences; however, students perceived their participation in the activity as only “somewhat” related to these skills. The item on which students’ perceived they had improved the most from pre- to post-experience was time management. Students felt that their attitudes regarding “taking responsibility as a health care provider” and “feeling a sense of community responsibility” improved quite a lot (79% and 83% respectively on the post-experience survey. Two-thirds of the class thought their ability in “communicating verbally” was improved “quite a lot” by the service-learning program.

In response to the post-experience reflection questions, 1 pharmacy student stated that, “this experience has been very helpful and valuable in allowing me to work on communicating effectively with young children and speaking on a level of their understanding. It was also very helpful to have the nutritionist come in to teach and prepare us for our lessons, since teaching is a new experience for most of us.”

In regards to the impact the students felt that they had through this program, one student reported “the children definitely had a significant impact on me. Children can learn and grasp ideas so proficiently it truly amazed me. It

was great to see them following along when we were doing the quizzes we gave them. I feel like we also had a notable impact on them as well. Every time we would come back after first working with them, the children were excited to see us. We would talk about things that we covered in past classes and they were able to reiterate every detail we had talked about.”

Tests of Elementary School Children

Prior to beginning the first lesson in each of the selected elementary school classes, the pharmacy students administered a pre-experience test to the children. At the end of the fourth lesson, a post-experience test was administered to the children. The test asked the children to match specific foods to the correct food groups as defined by the United States Department of Agriculture’s (USDA’s) MyPyramid. For example, one question asked them to identify which of the following would be included in the vegetable group: broccoli, carrots, grapes, pasta, spinach, and Swiss cheese. (The test is available at the MyPyramid.gov Web site, as part of a lesson plan targeted for children in first and second grade.)

An identification number created by the school system’s registered dietitian was assigned to each elementary school student to protect the children’s’ identity from the researchers. The Wilcoxon signed-rank test was used to evaluate the difference between the pre- and post-test scores for the elementary school children. Eighty-six students’ tests were excluded from analysis because the elementary student did not complete both the pre- and posttest.

Table 3. Pharmacy Student Pre- and Post-Experience Survey Scores, N=96^a

Survey Question	Test	No. of Responses ^b					Response, Mean (SD)
		SA	A	N	D	SD	
I am comfortable talking with children between the ages of 5 and 8.	Pre	20	44	21	11	0	2.2 (0.9)
	Post	57	33	2	1	3	1.5 (0.9) ^c
I feel confident in discussing principles of good nutrition.	Pre	15	52	21	8	0	2.2 (0.8)
	Post	51	39	3	1	2	1.6 (0.8) ^c
I believe it is important for pharmacists to be able to communicate with children.	Pre	61	32	3	0	0	1.4 (0.6)
	Post	74	17	2	0	3	1.3 (0.8)
I believe that it is important for pharmacists to understand and explain the principles of good nutrition.	Pre	61	30	5	0	0	1.4 (0.6)
	Post	67	23	3	1	2	1.4 (0.8)
I believe there is a significant need for nutrition education for elementary students.	Pre	55	38	3	0	0	1.5 (0.6)
	Post	59	32	2	0	3	1.5 (0.8)
I believe I will have/had a significant impact on elementary students through the “Kids Eat Healthy” program.	Pre	21	54	19	2	0	2 (0.7)
	Post	42	47	4	1	2	1.7 (0.8) ^c
The “Kids Eat Healthy” program is an important part of the LECOM Bradenton Doctor of Pharmacy curriculum.	Pre	30	53	11	2	0	1.8 (0.7)
	Post	61	26	4	2	3	1.5 (0.9) ^c

^a 1 = strongly agree (SA); 2 = agree (A); 3 = neutral (N); 4 = disagree (D); 5 = strongly disagree (SD).

^b Percentages were not reported as n = 96, and would therefore provide similar data

^c p <0.05.

Table 4. Pharmacy Students' Pre- and Postexperience Survey Responses to the Question of How Their Participation in the Kids Eat Healthy Program Improved Their Knowledge, Skills, and Attitudes^a

Response	No. of Responses ^b			Response, Mean (SD)
	Quite a Lot	Somewhat	Not at All	
Communicating verbally, pre-experience	63	30	3	1.4 (0.6)
Post-experience	64	29	3	1.4 (0.6)
Writing effectively, pre-experience	16	67	13	2 (0.6)
Post-experience	12	59	25	2.1 (0.6)
Managing time, pre-experience	32	52	12	1.8 (0.7)
Post-experience	43	45	8	1.6 (0.6)
Managing stress, pre-experience	32	46	18	1.9 (0.7)
Post-experience	32	51	13	1.8 (0.7)
Talking with sick people, pre-experience	27	47	22	2 (0.7)
Post-experience	7	25	64	2.6 (0.6) ^c
Talking with people of different cultures, pre-experience	49	40	7	1.6 (0.6)
Post-experience	31	55	10	1.8 (0.6) ^c
Providing leadership to others, pre-experience	61	33	2	1.4 (0.5)
Post-experience	56	37	3	1.5 (0.6)
Getting along with difficult people, pre-experience	46	45	5	1.6 (0.6)
Post-experience	33	41	22	1.9 (0.8) ^c
Mentoring other students, pre-experience	59	36	1	1.4 (0.5)
Post-experience	61	31	4	1.4 (0.6)
Feeling a sense of community responsibility, pre-experience	81	13	2	1.2 (0.4)
Post-experience	80	14	2	1.2 (0.4)
Taking responsibility as a health care provider, pre-experience	80	16	0	1.2 (0.4)
Post-experience	76	20	0	1.2 (0.4)
Showing empathy for patients, pre-experience	50	38	8	1.6 (0.7)
Post-experience	33	44	19	1.9 (0.7) ^c
Understanding the US healthcare system, pre-experience	28	50	18	1.9 (0.7)
Post-experience	23	39	34	2.1 (0.8)
Understanding the pharmacist's role, pre-experience	53	42	1	1.5 (0.5)
Post-experience	55	39	2	1.5 (0.5)

^a 1 = quite a lot, 2 = somewhat, 3 = not at all.

^b Percentages were not reported as n = 96, and would therefore provide similar data.

^c *p* < 0.05.

Four hundred sixty-eight elementary school students completed the pre- and posttests. More kindergarten classes were represented in the study population because all three of the schools chosen had kindergarten classes participate, but the other grades were not represented at every school. The results are presented in Table 5. Knowledge of food group matching improved among students in all grade levels, with kindergarten students improving by 3.2 points, first grade improving by 2.8 points, second grade improving by 3.4 points, and third grade improving by 2.0 points. The baseline average score in order from kindergarten to third grade was 60%, 63%, 71%, and 81%. The percentage of students in each grade level whose test scores improved by 10% or more is as follows: kindergarten, 61%; first grade, 55%; second grade, 58%; and third grade, 40%. When the results were analyzed according to the food groups, the third grade group did not make

significant improvement with the items for the vegetable group, and they also showed a decline in performance in the milk group. Overall, the third grade group had the least improvement compared to the other groups; however, they also had the smallest sample size.

DISCUSSION

LECOM's goals for service learning are to enhance the professional development of pharmacy students by providing a real world scenario in which to learn and grow. In this service learning program, the pharmacy students were compelled to contribute to their community and to interact with individuals of different ages and cultural and ethnic backgrounds outside of the typical classroom environment. The pharmacy students found the project to be a rewarding and beneficial experience. Not only were they able to develop and enhance their understanding of

Table 5. Elementary Student Pre- and Posttest Scores^a

Grade Level	Grain	Vegetable	Fruit	Milk	Meat and Beans	Total
Kindergarten (n = 234)						
Pretest	3.3 (1.1)	4.2 (1.2)	4.1 (1.4)	3.7 (1.4)	2.6 (1.6)	18 (4.7)
Posttest	4.1 (1.2) ^b	4.5 (1.2) ^b	4.6 (1.4) ^b	4.3 (1.3) ^b	3.8 (1.7) ^b	21.2 (5.0) ^b
Grade 1 (n = 76)						
Pretest	3.5 (1.0)	4.3 (1.3)	4.4 (1.1)	4 (1.1)	2.8 (1.3)	19 (4.3)
Posttest	4.3 (1.2) ^b	4.9 (1.2) ^b	4.9 (1.2) ^b	4.4 (1.1) ^b	3.5 (1.4) ^b	21.8 (4.3) ^b
Grade 2 (n = 96)						
Pretest	3.9 (1.3)	4.9 (1.3)	4.7 (1.1)	4.7 (1.2)	3.1 (1.4)	21.3 (4.4)
Posttest	4.7 (1.1) ^b	5.4 (1.0) ^b	5.3 (0.9) ^b	5.2 (0.9) ^b	4.1 (1.2) ^b	24.7 (3.3) ^b
Grade 3 (n = 62)						
Pretest	4.3 (1.0)	5.6 (0.8)	5.2 (0.6)	5.4 (0.7)	3.7 (0.8)	24.2 (2.1)
Posttest	5.1 (1.0) ^b	5.7 (0.8)	5.7 (0.5) ^b	5.2 (0.8) ^b	4.6 (1.1) ^b	26.2 (2.3) ^b

^a Food group scores are out of 6 possible points. Total scores are out of 30 possible points.

^b p < 0.05.

nutritional concepts, but also to pass this knowledge on to a group of high-risk elementary school children.

An interprofessional partnership also was developed that allowed pharmacy students to learn more about the expertise of registered dietitians, facilitating their understanding of the importance of multidisciplinary teams. This program was well received after the first year of implementation based on feedback from the pharmacy students, as well as from teachers and administrators from both the school of pharmacy and the Sarasota County School District.

Overall, the elementary school students' knowledge of nutrition education improved as a result of the intervention. Less improvement was seen among third-grade students compared with the other grade levels. This may have been due to the higher baseline score among students in this group, or to the smaller sample size compared to the other groups.

There were some limitations to this study. Some of the elementary school students were absent on the day of the pretest or posttest, resulting in the exclusion of their scores from the study analysis and limiting the sample size. Guidance from the pharmacy students when the children were completing the pre- and posttests cannot be ruled out and may have distorted the data. The test instrument used for all grade levels was designed for grades 1 and 2; therefore, the data may not accurately reflect the knowledge gains of students in the kindergarten group. Results may have been different if a grade-specific assessment was used for each individual grade.

Some key points should be taken into consideration to determine whether this program would serve as a beneficial service-learning experience at other institutions. Schedules must accommodate both the pharmacy school

and elementary schools' established curriculum. We took into consideration scheduled examination times and holidays for both institutions when determining when in the semester to schedule this experience. This program required scheduled time outside of regular class hours for the pharmacy students. However, selecting local elementary schools allowed for students to experience giving back to their community.

There are initial costs associated with visual aids, educational videos, and other items used in the lesson plans such as the vegetables that the children sampled during the food tasting lesson. When in the curriculum to introduce the program is another consideration. This service-learning program was intended to introduce students to a care-giving experience and facilitate the professionalization process prior to the structured IPPE completed in the first year. The nutrition content was considered appropriate for use at such an early point in the curriculum, when the pharmacy students' drug knowledge is insufficient to provide pharmaceutical care. Reflection writings required of the students also aided their own personal growth through the experience.

Future research might follow elementary school children longitudinally to identify retention of nutrition knowledge. To determine the full impact of the intervention, long-term assessment of the health benefits to the children who participated in the program, such as obesity rates, childhood diabetes rates, and the affect of childhood nutrition knowledge on the health of the family unit would need to be assessed.

CONCLUSION

This service-learning experience was beneficial for both the elementary school children and pharmacy students.

The overall results from the pre- and posttests suggest improvement in nutrition knowledge among elementary students, which could lead to better food choices in the future for these students. The pharmacy students perceived this service-learning opportunity as a positive experience and understood its value in the pharmacy curriculum. Their perspectives improved regarding communication with children and their ability to impact the health of the elementary students in the program.

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