

ILLUMINATIONS

Educational outreach as a simple, yet effective, service-learning opportunity for exercise science students

Edward K. Merritt¹ and Bronwyn O. Merritt²

¹Department of Health and Exercise Science, Appalachian State University, Boone, North Carolina; and ²Mabel School, Zionville, North Carolina

Submitted 15 December 2016; accepted in final form 27 April 2017

SERVICE-LEARNING ACTIVITIES for students in the health sciences often involve volunteer work at local wellness centers, nursing homes, hospitals, and blood drives. While service learning is certainly known to be effective and resources exist to aid in the development of service learning, unfortunately, students in the exercise science (ES) area frequently have difficulty finding ES-specific activities and express dissatisfaction in the level of relevance to the field of those that do exist. In fact, the first study of ES-specific service learning was only recently published (4). Even though service learning is known to improve student learning in areas similar to ES (1, 5), many college and university ES departments do not mention service-learning courses or opportunities on their websites. However, a community service need that exists, which can be easily met by ES students in service learning, is educating children on the benefits of physical activity and its role in health. The U.S. Department of Health and Human Services “Healthy People 2020” initiative has a goal to “increase the quality, availability, and effectiveness of educational and community-based programs designed to prevent disease and injury, improve health, and enhance quality of life” (8). Utilizing service-learning projects that engage ES students in educational outreach to promote health and physical activity to primary and secondary students is a relatively simple way to meet the needs of both the community and the ES students simultaneously.

In 2005, the American Physiological Society (APS) launched an educational outreach program to be implemented locally across the nation called “Physiology Understanding (PhUn) Week.” The goals of PhUn Week are to increase K–12 student interest in the study of physiology, introduce students to careers in physiology, increase teacher awareness of physiology in their curriculum, and involve physiology scientists in outreach to the community. The PhUn Week website and online resources are ideal for facilitating a faculty member or department’s first attempt at implementing service learning into the undergraduate and graduate ES curriculum (2).

The PhUn Week website includes numerous resources to provide ideas and aid in lesson planning as well as promotional materials and guides for establishing connections with K–12 educator. After partnering with a local K–12 teacher or school and submitting a planner to the APS, a physiologist will be sent a variety of items that can be given out to participating K–12

students. With these resources, much of the ground work for designing a service-learning experience for college students is already done. We describe a simple, inexpensive, and highly effective way to utilize PhUn Week as the foundation for a positive service-learning experience for college students, while also providing outreach and education to an important segment of the community.

PURPOSE

The primary purpose of this project was to design an outreach activity for ES students that allowed them to engage in community service while also meeting the health education needs of primary and secondary students in the community. A secondary goal was to provide ES undergraduate and graduate student volunteers experience in organizational, teaching, and leadership roles by allowing them to utilize their knowledge of the field to design relevant educational experiences.

METHODS

Utilizing the APS’ PhUn Week as a starting point, students were recruited from the ES majors club and classes within the Health and Exercise Science Department. After discussion of PhUn Week and specific dates and times, students who were interested and had time availability during PhUn Week were invited to an information and planning meeting ~6 wk before PhUn Week. Before the initial meeting, the service-learning coordinator and elementary teachers interested in participating decided on specific dates and times. In this case, third and fourth grade students were scheduled to come to campus for 4 h on one day, and fifth and seventh grade students on another day. Previous experience has proven that having set dates and times before outreach planning meetings is necessary for successful college student volunteer engagement, given the constraints of student class schedules.

After providing more specific information about PhUn Week, the service-learning coordinator divided volunteers into groups of four to five people based on schedule availability and the grade level with which they were interested in working. The groups were provided the relevant health and exercise-related educational curriculum standards for their respective grade levels and tasked with developing demonstrations and experiments that could be conducted in the allotted time (30 min to 1 h), while educating the students in line with the curriculum standards. Groups were advised to meet several times in the weeks before PhUn Week to brainstorm and prepare for educational demonstrations and experiments. Before adjourning the meeting, each group was asked to decide on a “captain” or “co-captains” who would be responsible for communicating with the service-learning coordinator, scheduling group meetings, and obtaining the necessary supplies and equipment needed for the demonstrations and experiments.

Address for reprint requests and other correspondence: E. K. Merritt, ASU Box 32071, 111 Rivers St., Boone, NC 28608 (e-mail: merrittek@appstate.edu).

Table 1. *Lessons, demonstrations, and experiments prepared by ES students for grade school students*

Grade	Topic	Activity
3	Skin	The skin's role in thermoregulation was demonstrated in an activity similar to that described by Limson et al. (7) using plastic bags made into gloves filled with different insulating materials immersed in ice water.
3	Muscle	Anatomical arm and leg models with removable muscles were used to create a puzzle for the students to complete. Students had to demonstrate the muscle movement after placing the muscle.
3	Skeleton	Each student's outline was traced on large sheets of paper, and then they were tasked with drawing in the major bones and labeling them.
4	Lung	Each student's lung volume was determined using a previously designed "Lungometer" lesson (3).
4	Skin	The importance of hand washing for health was demonstrated by having students dust their hands with a powder visible under UV light, touch surfaces around the room, and then wash their hands (GloGerm Kit, GloGerm, Moab, UT). The UV light highlighted areas that were dirty even after cleaning.
4	Heart	Students designed and used paper towel rolls as stethoscopes to hear their heart beats and were then given actual heart rate monitors and let loose on the playground.
5	Digestive	Volunteers aided students in assembling various household items into a "functioning" digestive system similar to the "Junkyard Digestion" activity (6).
5	All systems	Basic fitness assessments were discussed and then performed on each student, including tests for flexibility, muscular strength and endurance, and coordination.
5/7	Neuromuscular	Each student's vertical jump height was measured using the VerTec and a forceplate, which estimated jump height based on time off the ground. Handgrip dynamometry and pinch strength were measured using specialized research equipment (Biometrics).
7	Nerve	Two toothpicks separated by a set distance were used to poke different regions of the hands, arms, and face to teach about nerve sensitivity in different regions of the body. Reflexes were discussed using the standard patellar reflex technique.
7	Cardiorespiratory	Heart rate monitors and stethoscopes were provided to the students to monitor heart rate and breathing at rest and after exercise, with a competition to see who could have the highest heart rate.
All	Nutrition	Various activities were done, depending on the grade level using the "Choose My Plate" website and food models to teach about nutrition (10). Each grade also played a matching game to learn about the sugar content of drinks. Groups were given sugar-filled conical tubes, which had to be matched to the amount of sugar in commonly consumed beverages.

A


Appalachian
STATE UNIVERSITY

Physiology Understanding (PhUn) Week Evaluation

The purpose of this evaluation is for you to give us your opinion of PhUn Week, the students' presentation of themselves, the material that was taught, and the activities done with the students. We will be using a Likert scale of 1 to 5, meaning 1 is the worst and 5 is the best. Feel free to provide further comments on the back or on another sheet of paper.

- Rate the organization of PhUn Week.
1 2 3 4 5
- Rate the presentation of the college students, 1 being not presentable and 5 being very presentable.
1 2 3 4 5
- Please rate the interaction between the college students and the elementary students.
1 2 3 4 5
- Please rate the experiments done with the students. 1 being not very easy to understand and 5 being very easy to understand.
1 2 3 4 5
- Rate the material being taught as 1 being too complex and not relatable to students to 5 being grade level appropriate and relatable to students.
1 2 3 4 5
- Do you believe that the material presented helped students to learn Common Core State and NC Essential Standards?
1 2 3 4 5
- List any positive aspects of PhUn Week.
- List any improvements or suggestions you have for future PhUn Week activities.
- Would you have us return for PhUn Week next year?
YES NO
Please explain your answer.

B


Appalachian
STATE UNIVERSITY

PhUn Week Evaluation

The purpose of this evaluation is for those involved to critique and rate several aspects of the organization of and your involvement in PhUn Week. Rate different aspects using a Likert scale from 1 meaning no involvement to 5 being very involved.

- Rate your involvement in PhUn Week. This includes attending meetings, organizing projects, meeting with your group, and attending actual PhUn Week.
1 2 3 4 5
- Rate our communication to you about PhUn Week. 1 being you did not feel informed and 5 meaning very informed.
1 2 3 4 5
- What was your opinion of how PhUn Week was set-up? 1 being not organized and 5 being very organized.
1 2 3 4 5
- Please rate the experiments that were done with the children and whether or not you thought they were easy to teach and easy to understand.
1 2 3 4 5
- Would you participate in PhUn Week again next year?
Yes No
- Please list at least one aspect we could change to make PhUn Week better.
- Please list at least one aspect you thought was positive about PhUn Week.

Fig. 1. The surveys provided to the teachers (A) and ES student volunteers (B) at the conclusion of the educational outreach activity.

In the weeks before the students' visits, the service-learning coordinator worked to reserve classrooms and laboratories on campus and finalized the schedule. The ES volunteers designed the lessons, obtained the necessary supplies, and wrote up detailed methodology for demonstrations and experiments for their grade levels (Table 1). Lessons were provided to each grade level's teacher to ensure age-appropriate content and that the lessons matched with necessary curriculum standards.

During the days of the students' visits, ES volunteers served as escorts to and from the classrooms and laboratories, while others transitioned rooms and set up needed equipment for each lesson. Volunteers led the lessons as a team and engaged students in small groups. At the conclusion of the day, the student volunteers and the elementary school teachers involved received surveys to evaluate the organization, communication, and lessons and experiments created for the students (Fig. 1). Data collected for this project were deemed exempt from Internal Review Board review under exemption category "Normal Educational Practices and Settings."

RESULTS AND DISCUSSION

Eleven undergraduate and three graduate volunteers designed lessons and experiments to teach the skeletal, cardiovascular, skin, respiratory, and muscular systems, and the relationship of nutrition and exercise to health. Most resources needed for the lessons were obtained from the ES department or university library, although some had to be purchased. However, total costs were less than \$30. Volunteers each spent an average of over 10 h developing the lessons, and each averaged more than 3 h in contact time with the students during the lessons. The service-learning coordinator spent ~20 h over 6 wk on organizational and logistical roles and 5 h/day on the 2 days when students were on campus, for a total of 30 h worked.

Eighty-five students from grades 3, 4, 5, and 7 each spent 4 h on campus participating in PhUn Week (also 4 teachers and 2 bus drivers). Lessons were met with near unanimous enthusiastic interaction by students in grades 3–5. Seventh graders were a more challenging group to enthusiastically engage. Several logistical challenges were encountered, ranging from technology malfunctions to fire alarms to excessively long restroom breaks; however, the day was generally considered a success by all involved.

Results of the volunteer and teacher surveys are presented in Fig. 2. The majority of suggestions for improvement involved time management during the field trip visit. ES student volunteers expressed a desire to have better organization in the planning phase and implementation of the lessons. However, from the teachers' perspective, organization and curricular relevance of the lessons were excellent. Comments were unanimously positive, with many noting how much fun it was to be involved, and several volunteers noting that they felt more comfortable talking about physiology/science in public. An unplanned major outcome of the event was best summarized by a teacher's comment:

I feel the whole day was a positive experience. . . having our students on campus was one of the most beneficial aspects of this day. Hearing comments. . . "this is where I want to go to school" has to be the most important take back we had. Most of our students do not get to be on a college campus and putting this "goal" in their minds accompanied by a positive experience is invaluable.

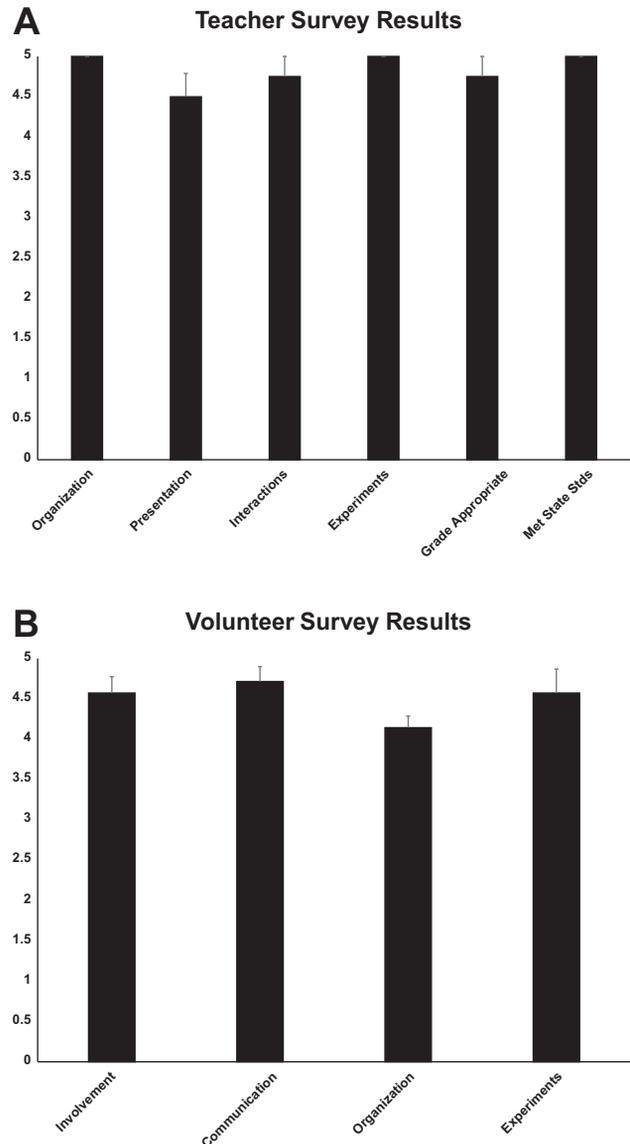


Fig. 2. The results of the teacher ($n = 4$; A) and ES student volunteer ($n = 10$; B) surveys. Five is the highest rating for each category. Values are means + SE.

Based on the survey results and teacher and volunteer comments, this educational outreach activity was valuable for both the school children and ES student volunteers. Due to the success of this activity, this program will be expanded to include schools throughout the region. Since there are currently no official service-learning courses in ES at this university, this program will be converted into a credit-bearing elective for the student volunteers. PhUn Week could also be utilized to answer the call to develop after-school activities to improve youth fitness and health outcomes. Similar projects have proven to be highly effective service-learning experiences (9), but PhUn Week could help establish the relationships needed to augment the experiences while also providing the resources to easily start a program. Overall, this ES service-learning project was successful and proves that educational outreach programs can be successful for all involved without prohibitive time commitments or costs.

ACKNOWLEDGMENTS

The authors thank the students and teachers from Mabel School, as well as the exercise science student volunteers.

DISCLOSURES

No conflicts of interest, financial or otherwise, are declared by the author(s).

AUTHOR CONTRIBUTIONS

E.K.M. and B.O.M. conceived and designed research; E.K.M. performed experiments; E.K.M. analyzed data; E.K.M. and B.O.M. interpreted results of experiments; E.K.M. prepared figures; E.K.M. drafted manuscript; E.K.M. and B.O.M. edited and revised manuscript; E.K.M. approved final version of manuscript.

REFERENCES

1. **Altermann C, Neves BS, Mello-Carpes PB.** The inclusion of undergraduate students in physiology outreach activities improves their physiology learning and understanding skills. *Adv Physiol Educ* 40: 529–532, 2016. doi:10.1152/advan.00012.2016.
2. **American Physiological Society.** *Physiology Understanding Week (PhUn Week)*. (Online). <http://www.the-aps.org/mm/Education/K-12/Education-Projects/PhUn-Week> [September 9, 2014].
3. **BioEd Online, Baylor College of Medicine.** *Lungometer: Vital Lung Capacity* (Online). <http://www.bioedonline.org/lessons-and-more/lessons-by-topic/ecology/air/lungometer-vital-lung-capacity/> [September 9, 2014].
4. **Bjerke W.** Service learning in higher education exercise science programs. *J Social Change* 4: 34–49, 2012. doi:10.5590/JOSC.2012.04.1.04.
5. **de Groot M, Alexander K, Culp B, Keith N.** Experiential learning in kinesiology: a student perspective. *Pedagogy Health Promot* 1: 123–133, 2015. doi:10.1177/2373379915594391.
6. **Hill D.** *Junkyard Digestion, Hill, Diana, Putnam City High School* (Online). <http://www.lifescitrc.org/resource.cfm?submissionID=384> [September 30, 2014].
7. **Limson M, Krontiris-Litowitz J, Ortiz RM, Pressley TA, Matyas ML.** The insulation bag: learning thermoregulation through a “hands-in” activity. *Adv Physiol Educ* 36: 65–67, 2012. doi:10.1152/advan.00102.2011.
8. **Office of Disease Prevention and Health Promotion.** *Healthy People 2020 US Department of Health and Human Services* (Online). <https://www.healthypeople.gov/> [March 29, 2015].
9. **Petersen JC, Judge L, Pierce DA.** Conducting a community-based experiential-learning project to address youth fitness. *J Phys Educ Recreat Dance* 83: 30–36, 2012. doi:10.1080/07303084.2012.10598793.
10. **US Department of Agriculture.** *ChooseMyPlate.gov* (Online). <https://www.choosemyplate.gov/> [September 9, 2014].

