From the Pupil's Perspective

By Amanda H. Beach and Lindsay S. Leech with Tod R. Clapp, PhD
Colorado State University

Abstract:

We suggest university anatomy outreach programs promote the personal and professional development of student presenters, better preparing them for healthcare professions. Through presentations to high school students, university student-led anatomy outreach programs provide opportunities to develop unique skills that may better prepare the university students to be successful future health care professionals. Some of these skills include time management, professional communication, scheduling, and working with emotional barriers. Importantly, delivering these presentations requires students to acknowledge and address their own weaknesses. Interacting with a variety of audiences, the university student presenters also learn how to communicate effectively by having to accommodate and adapt to varying knowledge levels. Ultimately, this better prepares them to convey difficult scientific information to a wide variety of individuals. These outreach programs benefit both presenters and audiences, allowing students to apply their knowledge, share their enthusiasm, as well as encourage an interest in science.

Introduction

The anatomy program at Colorado State University (CSU) is structured around a dissection course consisting of approximately fifty students and twelve cadavers. This course takes a regional approach to dissection and runs over the course of a 16-week semester every fall. The undergraduate human anatomy prosection course parallels the dissection course as well as provides access to ten additional cadavers dissected the previous fall. In this prosection course, there are five-hundred junior and senior level undergraduate students distributed among five laboratory sections allowing for a ratio of four to five students per cadaver. The prosection course is both laboratory and lecture based. The lecture portion is grounded in clinical applications strengthened by the intensive laboratory portion. To deepen this anatomical understanding, concepts from embryology, histology, anthropology, and physiology are also incorporated. In addition, digital supplementation with The Visual Human Dissector (VHD) and The Virtual Edge Anatomy software is used in the lab so students can compare live and virtual cadavers for an enhanced learning experience. This software also exposes students to cross-sectional images, vital for future healthcare professionals, and it serves as a valuable at-home study tool.

Accompanying the human gross anatomy prosection course is an outreach program that provides students in Colorado State University's honors program with unique opportunities. Through this program, students from the prosection course develop and deliver anatomy-based presentations to interested Colorado K-12 classes. The goal of our anatomy outreach program is to expose the K-12 classes to the field of science through interactive, hands-on anatomy presentations, and increase awareness of current health issues. Visual aids, which include healthy and diseased organs, are critical during these presentations to emphasize healthy lifestyles. They allow students to touch and manipulate preserved human organs. This haptic experience provides a greater impact as compared to purely oral presentations. These presentations also provide a venue to promote some of the unique opportunities at CSU; for example, CSU holds unprecedented access to twenty-two human cadavers.

The anatomy outreach program facilitates the student presenters' personal and academic growth. Student presenters have the opportunity to improve a variety of skills including: time management, scheduling multiple agendas, overcoming emotional barriers, and professional communication. These skills correlate to the general skills needed to succeed in science careers and in future clinical applications such as the patient-physician relationship. Current research has shown a linear relationship between involvement in educational outreach programs and successful clinical communication.[1] In this paper we examine the implications and impact of our anatomy outreach program. We have found that the presentations increase student presenters' understanding of the material and facilitate the development of a variety of unexpected skills which will be acknowledged and discussed in this paper.

Description

The core background knowledge enabling our students to be successful in delivering the anatomy outreach presentations is obtained largely from the Human Anatomy Prosection course. In addition, the student presenters involved in this outreach program are enrolled in a breakout honors section in which material from lecture is supplemented through the use of didactic case studies and the outreach presentations. While the case studies require students to do their own investigation and subsequently apply material that they have learned in lecture to diagnose hypothetical patients, the creative outreach presentations allow the anatomy students to share their knowledge with students from around the state.

First, the student presenters work in pairs to develop informative and entertaining presentations to be given in front of the honors breakout class. Then, using feedback from classmates and instructors, the student presenters improve their presentations for delivery to K-12 audiences. The student presenters are required to coordinate multiple aspects of the visit including room and date scheduling, distributing teacher guidelines, and ensuring specimen availability. The final product involves a group of visitors attending an hour-long presentation. During the first 30-40 minutes of the presentation, the student presenters use a collection of organs to advocate living a healthy lifestyle, spark an interest in science, and illustrate

key anatomical concepts from a clinical perspective. In the remaining 20-30 minutes, the K-12 audiences are given the opportunity to explore a cadaver and challenge the student presenters with questions. In some instances, if a group wishing to receive a presentation is not able to travel to CSU, student presenters will travel to a school with the collection of organs and deliver a 45-minute interactive oral presentation. The outreach presentations are centered on encouraging healthy lifestyles through exposure to diseased organs.

The success of these presentations hinges on the student presenters' mastery of a variety of skills such as thorough anatomical understanding, professional communication and scheduling, adept laboratory preparation, familiarity with the specimens, presentation skills, and dynamic teamwork. In addition, the student presenters are faced with the task of developing a presentation that is both engaging and informative to audiences of different ages with a variety of educational backgrounds. Student presenters are given significant freedom with their presentation content, leading to a multitude of creative outlets such as audience participation, metaphorical language, and the incorporation of personal anecdotes. One of the few requirements of the presentation is the discussion of body donation. This ensures all visitors that the cadavers and specimens were voluntarily donated and wished to contribute their body to learning. One major challenge to the student presenters is to leave the K-12 audiences with a greater understanding and/or interest in science, specifically involving the human body and how to properly care for it.

The anatomy outreach program requires a significant amount of preparation from student presenters and staff. A list of schools that have previously participated in the outreach program is given to the student presenters who are required to personally contact the teachers. If a teacher expresses interest in receiving a presentation, then the student presenters begin coordinating with the teacher. This entails sending teacher guidelines that encompass parking and building location, size limitations, fees involved, and the scope of the presentations. Typically, this communication continues over the period of a month. As the dates are being finalized, the student presenters compile a collection of diseased and healthy human organs obtained from prior dissections. Some of the interesting specimens include a brain, a melanoma liver, a cirrhotic liver, an emphysemic lung, and a heart with a pacemaker. A component of the student presenters' responsibility is to maintain the integrity of these specimens.

Several measures are taken to clean and prepare the laboratory to safely accommodate around 40 K-12 students plus two cadavers on the day of the presentation. Student presenters are responsible for ensuring adequate seating for all visitors and may encourage the visitors to sit down if they are feeling uncomfortable. After prepping the room, one presenter is responsible for greeting and directing the visitors to the laboratory, and the presentation begins.

Discussion

For over thirty-five years the Association of American Medical Colleges has recognized the importance of scientific outreach programs that serve to educate and recruit future students into the field of science.[2] The described presentations of the anatomy program acknowledge this importance of outreach and service learning. With initial hopes of educating K-12 schools in Colorado through awareness of science and the human body, the program today not only educates the K-12 audiences but it also allows the presenters to develop personal and professional skills. The program includes 22-28 student presenters per year who reach approximately 3,000 K-12 students from Colorado each year through their presentations. Student presenters' participation and the demand for presentations have increased since the program was first implemented in 2008. In this type of outreach, the student presenters engage in activities that meet community needs of coordinating with formal education to support an academic curriculum.[3]

Although the goals of the program are formally outlined (see addendum), from student presenters' perspectives, the development and delivery of the presentations is a dynamic process. Of the many challenges of this process, scheduling is at the forefront. Ideally, the visiting groups request a date and time that works with both the presenters' schedules and laboratory availability. However, this is rarely the case; instead, the scheduling tends to be a lengthy process requiring multiple emails until a final date and time is confirmed. This acquisition of time management skills and effective communication through a real-world application is essential to undergraduate students.[4]

The student presenters must anticipate the challenges that they will encounter on the day of the presentation. With cadavers on display, student presenters must be aware of the K-12 audiences' reactions to cadavers.[5] Encouraging students to sit down if they feel nauseated or to leave the room for water are essential elements of these presentations as they address the safety concerns of the K-12 audiences. The emotional responses range from sadness to fear, thus, student presenters learn to adapt and understand the individuals they are working with. This creates a sense of trust and establishes the presenters' roles as educators. Effective communication is a critical skill honed from this outreach, and it plays an important role in enhancing the student presenters' competitive skills in their chosen fields.[4]

Student presenters present to audiences with varying educational levels. Because of this, student presenters must adapt their presentation to each audience. For example, student presenters have the flexibility to emphasize healthy diet and exercise for middle school students, whereas older students' presentations place emphasis on physiological and anatomical effects of drugs, alcohol, and smoking. Furthermore, the student presenters are expected to utilize the age-appropriate tone and pitch for each K-12 audience. The ability to communicate scientific knowledge to others is a skill that student presenters can apply in future careers in which they must assess the needs of an individual and facilitate learning in a manner that is comprehensible to that individual.[6]

A personally challenging aspect of delivering these presentations is learning to acknowledge and address one's weaknesses. When learning through teaching, the thinness of knowledge is exposed to each student presenter, their peers, and instructors.[7] The obstacle is not to be intimidated by this exposure, but rather to use this transparency as fuel to master the material. Many outreach programs show that student presenters recognize that teaching material requires a deeper level of understanding in contrast to the fundamental college coursework.[7] This outreach program is no exception to that realization as student presenter pairs continuously practice and research the material on which they are presenting. Throughout the semester, there is a shift from apprehension to enthusiasm in the delivery of the presentations.

Feedback surveys were designed to assess the impact of the outreach presentations on both the visitors as well as the student presenters. The feedback survey of the student presenters includes questions regarding motivation, skills obtained, and attitudes towards the experience. Participation in these surveys is voluntary; therefore, the conclusions drawn do not

account for the total population involved in these presentations. According to the surveys, the outreach presentations have been well received by all of those involved. Many of the students participate in the optional survey and reflect upon their experience. A frequent theme cited by student presenters is enjoyment. This outreach program involves a role-reversal opportunity that gives the presenters the chance to share their passion and challenge others with science. Many students make a connection between the skills obtained and their future professional goals. A former student now at medical school states, "The program helped me to learn to better communicate with students effectively, and it also helped me to develop professionalism. It challenged me to really 'know' the material, because when you can teach it, then you really know it."

A separate survey was sent to the visiting K-12 teachers, which provided them the opportunity to critique the student presenters. The teachers unanimously indicated that student presenters were well prepared, knowledgeable, and able to appropriately communicate with their student audiences of varying educational levels. Teachers commonly note that in many cases the presentations exceeded their expectations. The overall attitude expressed by visiting teachers is reflected in this comment from an instructor who brought his class for a presentation, "The CSU cadaver lab is a terrific resource for instructors preparing students for health care careers. Aside from the information presented at the labs, encountering the cadavers is a way to prepare students for the rigors in the medical field on a psychological level." The psychological preparation noted is an item of importance for not only the K-12 audiences but also the presenters themselves.

Anatomy has historically served not only as a technical training tool but also as a means for training healthcare professionals to handle difficult emotions.[5] Undergraduate anatomy students in this program, many of which aspire to be physicians, are able to reap these benefits prior to matriculation in medical school. Students in the anatomy program become proficient anatomists, and additionally, they begin to understand their emotions in regard to death. It has been noted that one of the greatest challenges to first year medical students is dealing with the reality of facing death on a regular basis.[5] Practice in handling these complicated emotions allows students to develop a sense of professionalism that will impact their ability to confront dying patients in the future.[5] This outreach program takes this emotional component one step further by requiring student presenters to help their audiences cope with seeing and exploring a cadaver. This element corresponds to the responsibility that health-care professionals have in regard to communicating with the families of terminal patients. Ultimately, these presentations give student presenters a glimpse of their future professional role.[6]

Multiple roles have been assigned to physicians: expert, communicator, collaborator, manager, health advocate, scholar, and professional.[1] In order to address this array of responsibilities, many medical schools have implemented a curriculum involving the six core competencies adopted by the Accredation Council for Graduate Medical Education in 1999.[1] The competencies include patient care, medical knowledge, practice-based learning and improvement, interpersonal and communication skills, professionalism, and systems based practice.[1,8] This anatomy outreach program caters to each of these competencies. Student presenters use various specimens as well as cadavers to demonstrate certain pathologies, treatments, prevention, and to advocate for a variety of careers within the medical field. We believe this enables them to practice the competencies of patient care, medical knowledge, and systems-based practice respectively. Student presenters take part in self-directed learning in regard to the anatomy and pathology that they plan to emphasize in their presentation. Self-directed learning has shown to be a key component to professional development and the delivery of high-quality care.[1] The competencies of professionalism and adept communication are addressed through the student presenters' interactions with a variety of audiences, allowing the student presenters to master the material at hand via practiced-based learning. This type of teaching has also shown to be a valuable method for self-improvement.[1] The ability to acknowledge personal weaknesses and, furthermore, to address those weaknesses is perhaps one of the challenging parts of being a physician. Early exposure to this type of introspection is certainly advantageous to pre-medical undergraduates.[1]

There is no denying that teaching is a vital part of being a physician.[6] Through the delivery of anatomy outreach presentations, students are exposed to instances in which they must convey sensitive information. Teaching correlates to future patient education, specifically in learning how to explain things to someone who does not share the same educational background.[6] Additionally, evidence has shown a correlation between the successful communication of trained teachers versus those with no previous experience.[6] Perhaps by practicing the art of teaching via the anatomy outreach presentations, student presenters master a variety of skills better preparing themselves to ensure patient understanding and trust upon becoming a physician.

Notes on contributors

LINDSAY S. LEECH, is a junior Biomedical Science student in the Department of College of Veterinary Medicine and Biomedical Sciences at Colorado State University, Fort Collins, Colorado. She is active in anatomy outreach presentation and aspires to attend medical school.

AMANDA H. BEACH, is a senior Biomedical Science student in the Department of College of Veterinary Medicine and Biomedical Sciences at Colorado State University, Fort Collins, Colorado. She is active in anatomy outreach presentation and aspires to attend medical school.

TOD R. CLAPP, Ph.D. is an assistant professor in the Department of Biomedical Science at Colorado State University, Fort Collins, Colorado. He teaches Human Gross Anatomy, Human Dissection, and Human Functional Neuroanatomy.

References

[1]Gregory, J.K., et al. (2009) "Restructuring a basic science course for core competencies: An example from anatomy teaching." *Medical Teacher* 31.9. Pg 855-861.

[2]Houtz, L.E. and Quinn, T.H. (2007) "Build a Human Project: Improving Attitude and Increasing Anatomy Content Knowledge and Skills for Middle-Level Students." *Journal of Higher Education Outreach & Engagement* 11.2. Pg 21-32.

[3]Andrews, E., et al. (2005) "Scientists and public outreach: Participation, motivations, and impediments." *Journal of Geoscience Education* 53.3. Pg 281.

[4]Rao, S., Shamah, D. and Collay, R. (2007) "Meaningful Involvement of Science Undergraduates in K-12 Outreach." *Journal of College Science Teaching* 36.6. Pg 54-58.

[5]Arráez-Aybar, L.-A., Castaño-Collado, G. and Casado-Morales, M.I. (2008) "Dissection as a modulator of emotional attitudes and reactions of future health professionals." *Medical Education* 42.6. Pg 563-571.

[6]Amorosa, J.M.H., Mellman, L.A. and Graham, M.J. (2011) "Medical students as teachers: How preclinical teaching opportunities can create an early awareness of the role of physician as teacher." *Medical Teacher* 33.2. Pg 137-144.

[7]Elmendorf, H.G. (2006) "Learning Through Teaching: A New Perspective on Entering a Discipline." *Change* 38.6. Pg 36-41.

[8]ACGME. (2010) "Common Program Requirements". Accreditation Council for Graduate Medical Education <http://www.acgme.org/acgmeweb/>(Accessed 08/04/2012)