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WVSOM Anatomy Lab Tour Program: An Osteopathic Medicine Pipeline With Student Teaching Opportunities

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In spring 2013, the West Virginia School of Osteopathic Medicine (WVSOM) reformatted its Anatomy Lab Tour Program to include interactive stations in the gross anatomy laboratory. The design of the outreach program introduces high school and allied health learners to osteopathic medicine while working through anatomy laboratory stations and how the tenets of osteopathic medicine relate to a person's overall health and wellness. Throughout the history of the program, first- and second-year osteopathic medical students at WVSOM have helped teach visiting learners in the laboratory experience. The new program design allows more time for one-on-one time between the student teachers and the learners. Exit surveys have reported that the current program design creates a synergistic learning environment in which both the learners and student teachers benefit through the encounter. The authors present this case study of the WVSOM Anatomy Lab Tour Program to establish a baseline for the collection of information gained through participant surveys to assess the impact of the program on learners and student teachers.

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The history of the West Virginia School of Osteopathic Medicine (WVSOM) Anatomy Lab Tour Program spans more than 30 years.¹ Historically, the format of the program centered on cadaveric demonstration with visiting high school learners. A newer format, designed for spring 2013, included active learning opportunities. Participation expanded from mostly high school science classes and allied health care programs for high school learners to include more high school science classes and postsecondary learners enrolled in career programs. The new format added interactive stations to supplement the cadaveric demonstration. During the 2015-2016 program, the cadaveric demonstration turned into a self-guided station with supervision by either a faculty member or an osteopathic medical student, when available. The current format allows learners to work independently through multiple stations. The sessions are

self-guided, stressing the importance of observation. The purpose of the reformat is to challenge the learners' personal knowledge while experiencing hands-on interaction in the anatomy laboratory. The program allows each learner to bring their unique understanding of the human body through a complete educational cycle (observe, identify, understand, interpret, create), resulting in a greater comprehension of a healthy state and how health can fail. Historically, the WVSOM Anatomy Lab Tour Program has provided rural students with educational opportunities.¹⁻³ Learners who are raised in a rural area are more likely to return to a rural environment to practice medicine.⁴⁻⁶

The present article is a case study of the WVSOM Anatomy Lab Tour Program and serves to establish a baseline for the collection of information gained through participant surveys to assess the impact of the program on its participant learners. The purpose of this article is to look at how the program affects the learners' initial understanding of osteopathic medicine and whether there are any perceived benefits to the WVSOM students who participate as teachers.

Anatomy Lab Tour Program

The program takes place in the WVSOM gross anatomy laboratory and classroom in the Fredric W. Smith Science Building. The current 2-hour program consists of the 30 minutes in the classroom for introduction, followed by 1 hour in the laboratory, and ending with 30 minutes in the classroom for wrap-up discussions. Time is limited because most learners travel more than an hour to WVSOM and must return home for an afternoon bus route. Visiting groups arrange with their school districts for transportation to and from the WVSOM campus in Lewisburg.

The classroom introduction begins with how structure relates to the function of an organ. The central nervous system and how information from the environment is processed and how the body reacts is discussed, followed by the hierarchy of structural organization within the body, which supports the principle of the

body as a unit. The teacher then leads the group in examining how the body has self-healing abilities and homeostasis. These interactive discussions give new perspective to the material and encourage visitors to approach the laboratory session with an osteopathic understanding. Before entering the laboratory, learners are challenged to identify typical anatomy and the organization of organs within a system. They are encouraged to look for unhealthy structures and potential contributing factors of death when working with the cadaver. The basic information given about the cadaver includes sex, age at death, occupation, and general area of residence to establish the level of conveniences like food and health care that might have been available to the person while living. No personal or identifiable information about the individual is given. All reported information is from the death certificate in public record.

In the laboratory, learners work in small groups of 4 or fewer to test their knowledge by answering questions and engaging in material set up at 7 stations centered on the following learning areas: (1) questions involving the brain and spinal cord, (2) assembling and naming the bones of a skeleton, (3) identifying different microanatomical specimens based on appearance and description, (4) identifying abnormal findings on diagnostic images, (5) working with a cadaver to identify organs and their respective systems, (6) demonstrations of common pathologies, and (7) information about the history of osteopathic medicine, WVSOM, and the Rural Health Initiative (RHI). When available, osteopathic medical students (or *student teachers*) help teach at all of the stations in the laboratory.

The educational materials include a prosected cadaver prepared specifically for the program, plastinated organs, embalmed specimens, real and plastic bones, microscopes with slides, digital images, information about conditions, embedded brain slices, and a selection of diagnostic images. These stations include healthy anatomical specimens alongside common pathological specimens. Only groups with previous anatomical coursework participate in the cadaver station to better appreciate and honor the human body donation.

The learners return to the classroom to discuss what they found and to finalize unanswered questions. The lesson finishes with the learners constructing a differential diagnosis and confirming the cause of death as reported on the death certificate of the cadaver. The teachers discuss the different health conditions as they relate to the occupation and living conditions of the individual. To wrap up the lesson, the teachers discuss the osteopathic principles and how they relate to the foundational approach that osteopathic physicians bring to health care.

Methods

The information gathered for this quality assessment/improvement review did not meet the definition of research and therefore did not require review by the institutional review board at WVSOM.

Learners

For this case study, learners were invited to complete a voluntary survey about the program before departure. Survey data for the program year 2016-2017 were evaluated. Exit survey information collected in other academic years has yet to be compiled. The information collected on the survey included the learner's full name, gender, birthdate, email address, ethnicity, race, and name and location of their school. The survey includes the following feedback items about the experience:

- I have increased my knowledge about a career in osteopathic medicine. (Yes/No)
- As a result of today's program, I am more interested in a health career. (Yes/No)
- I have increased my knowledge of anatomy. (Yes/No)
- The part of the tour I enjoyed the most was....
- What would you change about the program?
- Additional comments

Student Teachers

Forty-eight students participated in the 2016-2017 academic year. In November 2017, an email was sent to

19 students (including 4 from previous years) who had taught frequently in the program and were likely to return comments. These 19 students were asked to provide feedback about teaching in the program with the question, "Can you tell me a little about your experience and what you might have gained from helping out?" The purpose of this question was to better identify appropriate questions to ask in future surveys.

Results

Learners

A total of 1263 learners submitted surveys during the 2016-2017 period, 1188 (90.9%) of whom reported that they had increased their knowledge about a career in osteopathic medicine. A large proportion (1059 [83.9%]) also confirmed that they were more interested in a health career because of the program. Most learners (1188 [94.1%]) indicated that the program increased their knowledge of anatomy ([Table 1](#)).

Exit surveys of the learners reflected how much they appreciated the interaction with the student teachers. While these results are anecdotal, they show that some of the learners thought enough about the experience to comment in the free response section of the survey. Not all sessions had student teachers available.

Sixteen learners responded that having student teachers in the laboratory was the most enjoyable part of the experience. Of these 16 learners, 12 were in visiting groups that had between 3 to 6 student teachers. Four respondents were from visiting groups with fewer than 3 student teachers ([Table 2](#)).

Twelve learners responded that the part they would change about the tour would be to have more student or other teachers at the stations in the laboratory (12 of 1263 respondents). Only 4 learners were from visiting groups that had 3 to 6 student teachers helping on the day of the visit ([Table 2](#)). It was suggested to have 1 teacher for each station.

In the additional comments section of the free response items, 15 learners provided responses regarding student teachers, and 13 remarked that the student

Table 1.
2016-2017 WVSOM Anatomy Lab Tour Program: Visiting Learners' Responses to Yes/No Questions on Exit Survey (N=1263)

Question	Yes	No	No Response
I have increased my knowledge about a career in osteopathic medicine.	1148 (90.9)	40 (3.2)	75 (5.9)
As a result of today's program, I am more interested in a health career.	1059 (83.9)	128 (10.1)	76 (6.0)
I have increased my knowledge of anatomy.	1188 (94.1)	3 (0.2)	72 (5.7)

Abbreviation: WVSOM, West Virginia School of Osteopathic Medicine.

teachers were knowledgeable and helpful (Table 2). Two learners suggested having more student teachers.

Student Teachers

Of the 19 student teachers contacted, 7 responded. The question "Can you tell me a little about your experience and what you might have gained from helping out?" prompted the following points:

- It forced the student to think about the material in a way that others could understand. It was not about oversimplifying the material but finding a way that

the concepts made sense to others with less background.

- By interacting with younger learners, the experience allowed self-reflection to see how much the path to medical school had encouraged the WVSOM students to grow as mentors and teachers for younger minds. It provided an opportunity to ignite a sense of passion for science in younger learners.
- It provided time to revisit anatomy content in the second year of school. The interaction reinforced clinical correlates and brought the student back to the big picture. It also served as a reminder of how

Table 2.
2016-2017 WVSOM Anatomy Lab Tour Program: Visiting Learners' Responses to Open-Ended Questions on Exit Survey (N=1263)

Free Response Questions	No. of Responses	
	Total	From Learners in Groups of 3-6 Student Teachers ^a
The part of the tour I enjoyed the most was...	1181	NA
Having student teachers	16	12
What would you change about the program?	1083	NA
More student teachers available	12	4
Additional comments	649	NA
Positive experience with student teachers	13	10
Need for more student teachers	2	0

^a Student teachers were osteopathic medical students who participated in the laboratory stations part of the program as they were able. Thus, the number of student teachers varied throughout the program.

Abbreviations: NA, not applicable; WVSOM, West Virginia School of Osteopathic Medicine.

Table 3.
No. of Visiting Learners and Counties Who Participated in the WVSOM Anatomy Lab Tour Program by Academic Year

Visiting Learners	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
Total Participants	545	1064	1383	1292	1092
High school	322	687	937	777	678
Career preparatory high school	140	191	259	220	123
Adult programs	83	186	187	295	291
Counties Represented	16	21	24	18	19

Abbreviation: WVSOM, West Virginia School of Osteopathic Medicine.

special human donation is and how critical it is to medical education.

- It provided a positive outlet for the student. Interacting with the visitors was an enjoyable way to take study breaks but still be actively studying by teaching.
- It reminded the student how important the act of teaching is in medicine. Learning through teaching compounds as the student progresses to residency and on into practice.
- It refocused the student from a self-centered time, when all that matters is the ability to learn and achieve self-driven goals, to an event where the student can use his or her acquired knowledge for the service of others. This was a reminder that the student pursued this career because he or she wanted to live a life of service.
- The student becomes a bridge for learners who may be trying to figure out what they want to do when they grow up or may not feel confident in their potential.

Discussion

Over the past 5 academic years (2013-2014 through 2017-2018), the outreach program has grown from fewer than 600 learners to more than 1000 learners each year (Table 3). These learners have traveled to WVSOM from 24 counties in West Virginia and

3 areas of Virginia (Figure). The visitors include high school and postsecondary learners enrolled in science courses and health care career programs.

The WVSOM Anatomy Lab Tour program has gained increased exposure to rural communities in West Virginia through the RHI. The RHI is a state-funded grant program established to improve interest and exposure to rural health care careers.⁷ It has been able to provide meals for students at some of these schools to remove the financial burden from the learners while away from their school.

The program provides an educational opportunity that is unique to the rural setting of WVSOM. The majority of the 55 counties in West Virginia are designated as rural, with the 3 largest cities each recording a population of less than 50,000 residents at the time of the 2010 US census.⁸ Many learners have never traveled as far as Greenbrier County. Thus, this field trip provides an experience of a new geographic area, as well as the unique perspective of the human body and how to care for it. For many, it provides a step toward a career in health care. The program provides a real-world anatomy learning experience for learners in local medical technology, nursing, paramedic, phlebotomy, surgical technician, and radiology technician programs. This program is an integral part of WVSOM's community outreach.^{5,9}

Informal formative assessments throughout the presentation guide the visitors to linking information

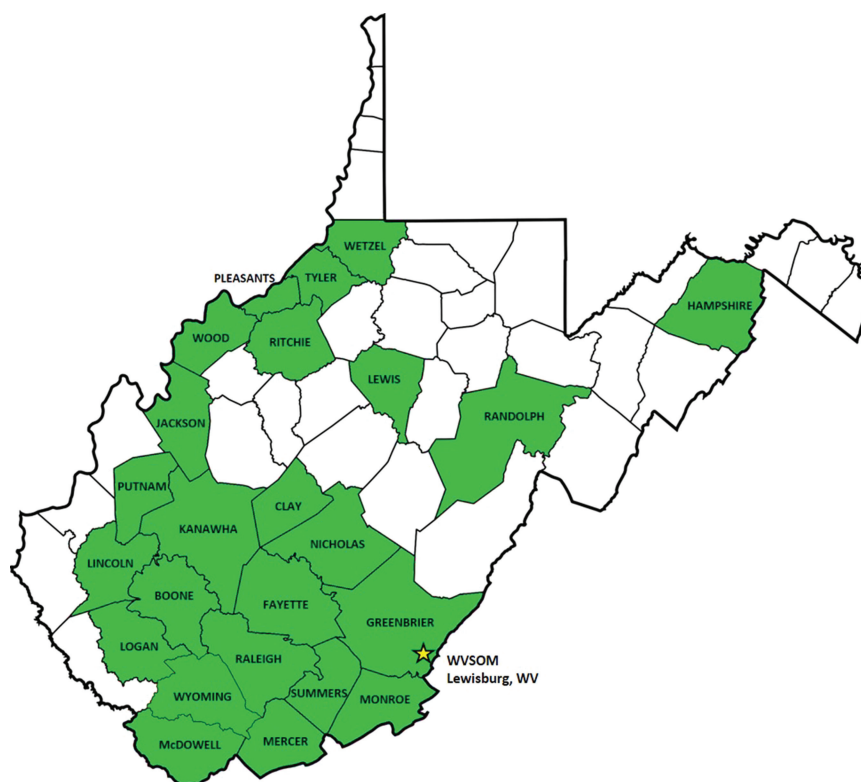


Figure 1.

Locations of school programs participating in the West Virginia School of Osteopathic Medicine Anatomy Lab Tour Program from 2013-2018.

previously learned to a practical application. One example is to ask, “Is the clavicle a tissue or an organ?” Most students who have had some microanatomy will respond that the clavicle is a tissue, thinking that it is composed completely of connective tissue. The teachers then define the levels of organization as previously learned. Once again, the question is asked with the added question of “Why?” The understanding is visible once the visitors recall that an organ is made of multiple tissues and that an organ system is composed of organs. With this deeper realization, the knowledge is paralleled to the other systems and the body as a complete unit. Each osteopathic tenet is discussed and applied to common understandings the visitors bring with them. By providing an opportunity to learn about the 4 tenets of osteopathic medicine early in the educational career, the program is creating a

greater understanding of osteopathic medicine throughout the rural areas of West Virginia.

Results from the exit survey given to participants in the 2016-2017 academic year show that a large majority (90.9%) report a better understanding of a career in osteopathic medicine on the day of the program ([Table 1](#)). The next step is to follow these individuals to see how many enter into a health care career and ultimately enroll in osteopathic medical school.

Similar outreach programs have been shown to influence the career paths of participants. In 2014, WVSOM reported on the success of the Mini-Medical School Program in providing insight to rural participants about osteopathic medicine and the process of becoming a physician.¹⁰ The Southwestern Ontario Medical Mentorship Program (SWOMMP) was a pilot program where medical students presented a program to high

school learners about various aspects of medical school with some hands-on learning. Preliminary results showed that high school learners gained a better understanding of a career in medicine, as well as increased interest in the field.¹¹ The Doctors of Tomorrow program has shown success as a pipeline program from the University of Michigan Medical School, developing underrepresented learners to be competitive college applicants and possibly future medical students.¹² The Summer Enrichment Experience provided by the Edward Via College of Osteopathic Medicine-Carolinas has shown that high school participants in a week-long summer program improved their knowledge of basic biomedical concepts and health sciences.¹³

Effect on Student Teachers

Having osteopathic medical student volunteers to teach in the laboratory provides an opportunity to engage in peer teaching (people from similar social backgrounds who are not professional teachers) with learners who see these teachers as future selves and mentors. Observationally, the learners engage quickly with the student teachers and ask questions about the path to medical school and experiences in the career field. Peer teaching experiences have been described previously, discussing the benefits to both the learners and the student teachers.¹⁴ Preparing to teach requires a different type of learning than when preparing for an examination. When the students volunteer to teach in multiple tour events over a short period, observationally, they refine their explanations to the learners. In this study, student teachers claimed to acquire a deeper understanding of the material. However, teaching others brings many benefits to students beyond gaining a greater depth to the material. It provides students time to refine their communication skills and revisit content learned in the first year of classes. Most importantly, it allowed the students time to step away from the study materials, reflect on their own path, and revisit why they chose osteopathic medicine as a career. One common theme through all of the responses was that the program allowed students to give back to learners

who are standing where they once stood. Others have written that by volunteering with high school outreach programs, graduate students are more likely to continue these activities throughout their careers.¹⁵ Teaching has also confirmed the benefits of building self-confidence and the manipulation of self-perception into that of the role of teacher. Through this newfound role, students gain a better understanding from the learner's point of view.¹⁶ This understanding is a foundational skill used by an osteopathic physician when interviewing a patient.

Limitations and Future Studies

The information provided in this article is limited to survey data for the program year 2016-2017. Survey data from additional program years, along with a follow-up inquiry, are required to assess the long-term impact. The plan is to look at 2 additional sources of information as the project continues.

Beginning for the 2016-2017 AACOMAS application cycle, the WVSOM secondary application included an additional checkbox asking applicants to indicate whether they participated in the Anatomy Lab Tour Program. This tracking provides a source of information to identify how many learners apply, matriculate, graduate, and ultimately practice in the region. Over time, this tracking will help determine whether the program is stimulating greater interest in becoming an osteopathic physician.

The second source of information planned for future review is to survey the past participants of the Anatomy Lab Tour Program. Each learner voluntarily provided an email address for future contact for the purpose of answering surveys and receiving invitations to activities held at WVSOM. A survey of past learners can provide more information, including what they understand about osteopathic principles and whether they pursued a health care career.

We received responses from only 7 osteopathic medical students who participated in the program, and these students had been identified as being engaged in the program, which may have skewed the responses received. A full survey is planned to be sent to all

osteopathic medical students who served as student teachers in this program.

Conclusion

For more than 30 years, WVSOM has invited learners into the anatomy laboratory to learn more about human anatomy and health care careers. With the latest redesign of the program, WVSOM has begun to track a greater awareness of osteopathic medicine in rural communities where visitors learn to look at the human condition through the 4 tenets of osteopathic medicine. The program also refines communication skills and reinvigorates osteopathic medical students to mentor the next generation of the health care team. The goal is to nurture these understandings and increase the population of osteopathic physicians in rural areas of West Virginia.

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