INTRODUCTION

In a historical sense, the study of anatomy has long been a tactile, physical, and extant art: using the hands and eyes to study the human body, often in the form of a theatrical spectacle based on cadaver dissection (de Carvalho Filho et al., 2021; Brenna, 2022). Well into the modern era, little has changed about learning anatomical sciences. Students (university students of all levels, including professional students of medicine and science) study under skilled masters (anatomy faculty) in small-group settings to learn the form of the body. Many of those students, especially doctoral students, may go on to train others in the fine art of dissection, perpetuating the well-established tradition of learning in a master/journeyman/apprentice model.

Dissection of the human body is a unique learning experience that can be supplemented by alternative methods (i.e., augmented reality, 3D visualizations, virtual dissections). The study of anatomy is a team-driven field in which anatomy instruction occurs in small groups in the laboratory with one faculty member guiding students through each anatomical region. One laboratory experience may include several small group instructors in one simultaneous learning session. In comparison, the education of future gross anatomists often happens in an apprenticeship model, where the optimal learning outcomes are met through training with an experienced mentor. It was the vision of the authors to further their education through initiating an inter-institutional exchange to apprentice with innovative mentors in order to bring new ideas back to their own gross anatomy courses. The Southeastern Conference, a consortium of the Universities in the Southern region of the United States often associated with intercollegiate sports, has a host of academic initiatives in addition to the athletic emphasis. The Southeastern Conference Faculty Travel Program is one mechanism by which the organization promotes scholarly excellence. In this case, the Faculty Travel Program provided a way for authors from the University of Kentucky to visit a nearby institution, Vanderbilt University, and learn from like-minded anatomy educators, with the goal of incorporating changes in their courses geared toward quality improvement. After this implementation, positive themes emerged in the student feedback on course evaluations. However, the collaboration was interrupted by the onset of the Covid-19 pandemic. This article examines the strengths of interinstitutional apprenticeship and the benefits of such practices in a time of accelerated change in anatomical instruction.

KEYWORDS

apprenticeship, Covid-19 pandemic, faculty development, gross anatomy education, medical education, mentoring, scholarship of teaching and learning
learning human anatomy was abruptly put on hold as the Covid-19 pandemic shut down institutes of learning around the world (Pather et al., 2020, Patra et al., 2021, Harmon et al., 2021, Attardi et al., 2022). This immediately posed a problem for the largely kinesthetic methods of anatomy instruction. As precisely asserted in Singal et al. (2020) “Almost all the medical students, especially residents in surgery instigate their anatomy education by disassembling a human body.” Regrettably, due to Covid-19, trainees at all levels were not able to participate in this essential hands-on training.

While anatomy education has largely been implemented with human dissection for many centuries, it is undeniable that digital supplements have reduced if not replaced the traditional study of the human body in more recent years (Solyar et al., 2008, McBride & Drake, 2018, Zhao et al., 2020). Moreover, students have sought out supplemental videos for anatomy education on social media platforms, such as YouTube (YouTube LLC., San Bruno, CA) long before the health-mandated policies restricted classroom time (Barry et al., 2016). Creative outlets like online digital gamification have also added a collaborative dimension to the classroom (Janssen et al., 2015, Felszeghy et al., 2019). Upon the Covid-19 shutdowns in early 2020, technological devices that were previously used to enhance the study of anatomy were suddenly the primary—and often only—mode of teaching. The virtualization of anatomy occurred in short order, with extensive use of virtual learning environments, two-dimensional images of medical illustrations alongside cadaver-based images, and voice-over videos (Longhurst et al., 2020, Byrnes et al., 2021, Padra, et al., 2021, Attardi et al., 2022). Some instructors turned to personalized dissection videos if they were available, created new media, or relied on publisher resources to show the anatomy of the human donor cadaver to their students (Harrell et al., 2021; Attardi et al., 2022). Various universities that host online anatomy archives certainly saw increased traffic as instructors sought out supplemental resources to “replace” the laboratory experience (Longhurst et al., 2020). Lecture halls and laboratories that had been full of energy and activity sat empty, replaced by students and teachers confined to the computer screen who need only dress from the waist up. In hindsight, many of these transitions were viewed as opportunities for live-streamed instruction across remote sites and an expanded presence in the realm of remote learning with a more diversified repertoire of pedagogical techniques (Pather et al., 2020, Iwanaga et al., 2021). In fact, in addition to the logistical delivery of information, one study concluded six thematic enhancements to anatomy instruction post-Covid that address the more esoteric classroom essentials: “community care, clear communications, clarified expectations, constructive alignment, community of practice, ability to compromise, and adapt and continuity planning” (Pather et al., 2020).

Although this impact was felt across each and every discipline at the academy, anatomy education took a particular hit: it has historically been a tactile-driven discipline, dependent on an in-person apprenticeship with the anatomy faculty and reliant on the irreplaceable relationship with the donor body. A thorough exploration of the human body is an integral part of the learning process in this setting. The essence of the dissection experience is to uncover the complex layers that compose a human while recognizing that this is not strictly the goal of the learning task (Jones, 2021). There are numerous elemental skills that are sharpened alongside the dissection process, such as grappling with death and dying (Flack & Nicholson, 2018), fostering respect for the lived life and dignity of the individual (Goss et al., 2019), and the awkward evolution of teamwork in the process (Flack & Nicholson, 2018). Three essentials are required for the system to work as intended: faculty (masters and journeypersons—those who have completed foundational education but are not yet full masters) trained in teaching gross anatomy, learners (apprentices), and the human body donors without whom the training programs would go extinct.

Of these three elements, the most limiting factor is likely faculty, followed closely by donors (Wilson et al., 2020, 2021a). Efforts have been made to train the next generation of anatomy faculty, including discipline-specific doctorates and/or certifications. There are various gross anatomy training certificate programs across the United States, that in effect largely rely on a modified apprenticeship model (Doss & Brooks, 2016; Richardson-Hatcher et al., 2018). However, the formal training of anatomists is waning, and shortages of educators able to teach gross anatomy are expected (Wilson et al., 2020, 2021a). Some number of doctoral programs specifically training anatomical and medical science educators do exist (Brokaw & O’Loughlin, 2015). In addition, there have been proposals in favor of normalizing post-doctoral training fellowships for the professional development of new graduates seeking to become anatomy educators (Schaefer et al., 2019). In fact, one recent survey suggests that anatomists across the globe, particularly early career anatomists, would benefit from professional development programs and training to facilitate their transition from doctoral student to anatomy faculty (Kramer et al., 2020). There is clearly a demand for continuing education opportunities for anatomists. Thus, the University of Kentucky faculty sought out this opportunity for continuing education (apprenticeship) in order to generate and implement actionable
changes to the curriculum of the Applied Human Anatomy course for fourth-year medical students at their institution.

Faculty travel grant

The Southeastern Conference (SEC) is a consortium of 14 Universities in the southern region of the United States, most often associated with intercollegiate sports. Comparable conferences exist in other regions of the country, such as the Big Ten, Big 12, Atlantic Coast, and Pac-12 conferences. The SEC also has a number of academic initiatives under the header of the SECU (Southeastern Conference Universities), with the goal of promoting the non-athletic excellence of the Universities in the SEC. The SEC Faculty Travel Award is one component of the SEC Academic Initiatives plan that promotes collaborative teaching, research, and service among the faculty at the Fourteen SEC Universities (Alabama, Arkansas, Auburn, Florida, Georgia, Kentucky, Louisiana State, Mississippi, Mississippi State, Missouri, South Carolina, Tennessee, Texas A&M, and Vanderbilt). The travel grant, established in 2012, provides faculty members from each of these universities the opportunity to journey to one or more fellow SEC institutions to learn a skill, collaborate on a research idea, give a lecture, or explore an educational goal. Each University is provided $10,000 in grant funds to allocate to its faculty awardees accordingly. There is often an internal competitive application within each College at a University. At the University of Kentucky, for example, there was an internal call for applications in the College of Medicine and the college put forth a recommendation to be considered for the funds from the University allocation. The funds were awarded to 12 faculty across the SEC in the 2019–2020 academic year. This provides opportunities for faculty from any part of the academy to travel in order to exchange information and ideas with nearby SEC Universities and to establish collaborations that continue beyond the funded time frame. Per the SEC website (SEC, 2022) the goals of the program are to:

- Highlight the endeavors and achievements of SEC faculty, students, and universities.
- Advance the academic reputation of SEC universities beyond their traditional regions.
- Identify and prepare future leaders for high-level service in academia.
- Increase the amount and type of education abroad opportunities available for students.
- Provide opportunities for collaboration among SEC university personnel.

Once awarded, the funds are typically applicable for the academic cycle beginning July 1st and ending on June 30 of the following year. At the conclusion of the year-long partnership, the grant awardees provide a synopsis of the connections formed and collaborations born out of the SEC travel funds to be compiled for overarching program outcomes. The SEC scholarships especially promote multidisciplinary emphasis as faculty from colleges across campus are encouraged to apply and there are numerous sites from which to tailor one's educational collaboration.

The journey to the collaborator institution

When two gross anatomy faculty at the University of Kentucky envisioned a collaboration with colleagues at Vanderbilt University as part of the SEC Faculty Travel Program, the goals were centered on sharing ideas for dissection-based laboratory course design for senior medical students. The dissection elective for fourth-year medical students at the University of Kentucky, "Applied Human Anatomy," was about to be under the management of a new course director, and the course would be revamped to incorporate surgical approaches, imaging, and general clinical applications. The aims of this quality improvement study were to learn approaches from the Vanderbilt University gross anatomy faculty to implement at the University of Kentucky in order to improve the learning experience for the students.

The preliminary visit of the University of Kentucky faculty to Vanderbilt University Medical Center in Fall 2019 was successful and fulfilling this vision. The authors interacted with a faculty member and course director during the "Medical Imaging and Anatomy" course at Vanderbilt University, an integrated science course for upper-level medical (post-basic sciences coursework) students that feature time spent in the radiology reading room (the clinical space where x-rays are reviewed), time spent in the dissection laboratory, and a pedagogical emphasis on peer collaboration and presentation (Wong et al., 2020). The University of Kentucky faculty were able to observe the Vanderbilt University laboratory space, course design and execution, student/faculty interactions, and student presentations. They returned home energized to implement new ideas and ready for their second visit slated for Spring 2020.

However, the Spring visit would never occur. Due to universities being thrust into online learning environments and interstate travel being restricted because of Covid-19, the follow-up visit was canceled. While the SEC program coordinators did extend the allowable timeframe for use of the funds for an additional year, the harsh reality of ongoing travel restrictions continued to render a second visit an impossibility. Nonetheless, the earlier fruitful exchange of ideas was still rewarding, and changes inspired by the visit to Vanderbilt University could be incorporated into the University of Kentucky course. Upon the Fall 2020 offering of Applied Human Anatomy at the University of Kentucky, three specific changes were incorporated into the course as a result of the earlier visit to Vanderbilt University: (1) Students were assigned to specific regions of study at the same silent learning partner (donor body); (2) Peer teaching was emphasized, both during dissection in the laboratory and for the final course presentation; (3) Clinicians were invited as guest presenters in the laboratory (discussed further in the results section).

The goals of this short communication are to disseminate the results of the course revisions that were implemented as a result of
the inter-institutional exchange described herein and to encourage other faculty to seek out apprenticeship-style learning to further their own professional development.

MATERIALS AND METHODS

Clinical Anatomy and Radiology course at the University of Kentucky

At the University of Kentucky College of Medicine, matriculating students have completed three to 4 years of college coursework: that is to say, they have completed around 4 years of university-level study (after completing the standard kindergarten through year 12 primary school experience) in order to earn a Bachelor's level degree before beginning medical school. The undergraduate medical curriculum at the University of Kentucky is a four-year program; the first 2 years are generally focused on basic science training and the last two are more clinical/application training. The College of Medicine at the University of Kentucky enrolls approximately 140 students at the Lexington campus, 30 at a satellite campus in Western Kentucky, and 35 at a satellite campus in Northern Kentucky. At the time of this writing, the first course of the first year is titled, “Clinical Anatomy and Radiology.” Within this course, gross anatomy is one rather minor component, and the students view faculty-dissected prosections in the laboratory on designated days for application of the didactic material. For example, one integrated day included rotations between prosections, physical examination, and clinical case studies. One-half of the class rotates through these categories on 1 day, while the other half of the class has scheduled study time. The next day, the roles are reversed. The prosection experience included six sessions of guided review of the anatomy (8 h total) on the following regions: back/upper limb, thorax, abdomen, pelvis/lower limb, head/neck 1, and head/neck 2.

Applied Human Anatomy elective course at the University of Kentucky

In the fourth year of the medical curriculum, the students have an option to take a dissection-based anatomy, typically offered in 4 weeks in the late fall (mid-November–December). The “Applied Human Anatomy” course at the University of Kentucky ran for many years in a static format. Students (usually over 100 enrollees) had open access to three donor cadavers and were told to dissect an area of interest relevant to their specialty of choice. They had to write a final paper summarizing their findings.

As a result of transitioning the first-year anatomy curriculum from dissection to prosection in 2016, the fourth-year Applied Human Anatomy course was dramatically overhauled as of 2019. Students (now 15–30 enrollees) were assigned to a donor cadaver by body region. One donor was for the abdomen and thorax, one was for limbs, and one was for the head and neck, for example, and a total of six donors were used. The course assessment included a written examination of the student's assigned body region and a written paper. The course only ran in this format for 1 year.

The redesign of the Applied Human Anatomy course that occurred as part of the quality improvement project discussed in this short communication included three primary modifications. First, students at each donor table were assigned to different body regions. For example, at one donor, a student was assigned to the head and neck, a different student to the abdomen and thorax, and a third student to limbs. This worked extremely well. Additionally, the course assessment was rebuilt to include an oral presentation highlighting the anatomy they learned in a clinically relevant context. Part of the presentation requirement was to include images from their specific dissection to guide peers through the anatomy most relevant to their clinical application. Finally, students completed an oral laboratory examination in which they presented their mastery of the anatomy on their donor to one of the course faculty. It was expected that the student would concentrate primarily on the region they dissected for the oral anatomy examination.

These changes were taken on as part of a course quality improvement project, and thus the work has been declared outside the realm of research according to the University of Kentucky Institutional Review Board. Per the University of Kentucky IRB, this umbrella categorization permits the use of student feedback from routine course evaluations in this short communication.

Curricular changes to the University of Kentucky elective course

The first two curricular changes made to the course at the University of Kentucky are closely interrelated. The first modification was in assigning students to specific areas of study with the same silent learning partner and using this arrangement to promote peer teaching. At Vanderbilt, University the students in Medical Imaging and Anatomy are assigned to a specific dissection (Wong et al., 2020). For example, a student interested in Cardiology would dissect the heart. Another student interested in abdominal surgery dissected the abdomen. At the University of Kentucky, the course was redesigned such that there were generally three to four students per table—one assigned to head and neck, one to thorax and abdomen, and one or two to limbs, for example. The second change, which is directly related to the first, is an emphasis on peer teaching in the laboratory. In years prior, if a student was studying limbs, there was no suggestion that they also study other body regions. This new emphasis on peer teaching and the dissection model allowed the students to learn the different body areas directly from their peers as they dissected in tandem. In addition, a final course presentation was added in which the student focused on a clinical question (that was meant to drive their dissection for the duration of the course), and all students attended the peer lectures. These presentations consisted of a correlate clinically relevant to their region of study, a summary of the
anatomy of the dissected regions, and lessons learned that can be applied in their future residency experiences.

The third major change to the course at the University of Kentucky was the inclusion of clinicians as guest presenters. The Medical Imaging and Anatomy course at Vanderbilt University is led by clinician-educators (a surgeon-anatomist and a radiologist), while at the University of Kentucky the Applied Human Anatomy course is led by basic scientists. With the new inclusion of clinicians as guests in the latter course, the students were exposed to the perspectives of surgeons in the context of gross anatomy. Guests in Fall 2020 included a neurosurgeon, a general surgeon, and a senior resident from plastic surgery. Future iterations of the course will hopefully have these surgeons return, and expand the clinician presence. Referring to these clinician guest sessions, one student said, “These sessions alone make the course worthwhile,” (transcribed from a verbal comment made by a student). When considering these are fourth-year medical students about to go on their way to residency, that seems to be a note-worthy perspective. A subsequent, related goal of the ongoing course redesign at the University of Kentucky is to include medical imaging in a more specific way. The integration of anatomy and imaging was facilitated by the creation of an "Anatomy Interactives" website housing radiological images with basic anatomy labeled and highlighted that will be utilized in future offerings of the course (Platt, 2020).

Qualitative analysis of course feedback

Qualitative responses were analyzed using an inductive theory approach, a theoretical approach used when general topics of the response data are not known and can be deduced from thematic analysis of open-ended responses (Thomas, 2006; Watling & Lingard, 2012). A coder (K.P.) analyzed the 2019–2021 course feedback open-ended responses according to recurring themes to three specific end-of-semester questions on the classroom teaching evaluation, including specific strengths, weaknesses, and areas of improvement for the course. Themes across collated answers to these questions were identified by a categorical phrase. Representative comments are listed in Table 1.

RESULTS

Student feedback

Student responses to the course changes were overwhelmingly favorable. Thematic analysis of the course evaluations revealed three major areas of interest: assessment, self-directed learning, and faculty support (Table 1). Based on the thematic analysis, students especially appreciated the self-directed nature of the coursework. One

| Theme 1. Assessment | Representative student comment(s) |
|---------------------|----------------------------------|
| 2019                | Remove quiz at the end. Practical and Paper are enough. I was tested on questions not pertinent to my dissection |
| 2020                | ... really interesting presentations at the end |
| 2021                | The course was well organized, expectations were clear, methods of evaluation were appropriate and achievable |
|                     | You know ... at first I honestly thought the clinical presentations by classmates would be a chore but I actually liked learning from everyone and the various clinical questions my peers explored |
|                     | I liked the opportunity to put together a presentation on a clinically relevant topic |

| Theme 2. Self-directed learning | Representative student comment(s) |
|---------------------------------|----------------------------------|
| 2019                            | Independent dissections (especially since we did prosections in anatomy as first years) |
| 2020                            | I loved the individual topic-directed dissections and study—it made for really interesting presentations at the end. It was also SO helpful (and fun and satisfying) to dissect myself |
| 2021                            | A great course for students interested in a surgical specialty. The course instructors provided guidance on anatomical dissection but also encouraged student independence in dissecting their own cadaver |
| 2021                            | Freedom to explore independent clinical questions |
| 2021                            | Great opportunity for self-directed learning with resources I could not obtain otherwise |
| 2021                            | Autonomy on area of study and when you can do your work while balancing interviews/etc. |
| 2021                            | Great opportunity to apply anatomical knowledge to our newly developed clinical knowledge. I love that the course is self-paced and aimed at exploring your own personal curiosities |
| 2021                            | I loved the freedom and autonomy we were given to direct our own study during the course |

| Theme 3. Faculty support | Representative student comment(s) |
|--------------------------|----------------------------------|
| 2019                     | Incredibly passionate anatomy faculty |
| 2019                     | [The faculty] were amazing instructors and were very helpful on a day to day basis in the lab |
| 2020                     | Excellent hands-on support by faculty during lab time |
| 2020                     | The course instructors provided guidance on anatomical dissection but also encouraged student independence in dissecting their own cadaver |
| 2021                     | Flexibility to pursue my interest, along with guidance and help from faculty |
| 2021                     | The instructors are incredibly helpful as well |
major advantage to the structure of the course is that students are relatively free to steer their dissection approach based on their area of interest or a clinical question that they want to learn more about. While they are provided with written dissection guides (produced by former University of Kentucky faculty and handed down from year to year), they are not beholden to any particular approach, technique, or finished product. As seen in Table 1, the students strongly appreciated this element of the course design. Thus, the first goal of the SEC travel experience—to promote a self-directed learning experience for fourth-year students at the University of Kentucky—was achieved. This element of course design is a feature of upper-level medical education and is an indicator of readiness for future autonomous and self-directed learning.

**DISCUSSION**

The purpose of the faculty exchange described herein, and the SEC Faculty Travel Grant awarded to support such exchanges is multivariate. The University of Kentucky cohort was first actively seeking an exchange of ideas regarding the medical curriculum at Vanderbilt University School of Medicine, with a particular interest in Vanderbilt University’s third- and fourth-year immersion course on Medical Imaging and Anatomy (Wong et al., 2020). The visit to Vanderbilt University would serve to inform the University of Kentucky faculty on successful practices that Vanderbilt University faculty have used to encourage self-directed learning, by enabling the students to enhance their own clinical knowledge within an anatomy framework.

A second related goal of the inter-institutional collaboration between the University of Kentucky and Vanderbilt University was to lay the groundwork for future educational enhancement, exchange of ideas, and possible scholarship. As mentioned prior, the training of gross anatomists largely follows an apprenticeship model, and there is likely no better way to broaden one’s horizons as an educator than to see what innovative things others are doing in your field. While the exchange of scholarly ideas en masse at educational conferences is extremely valuable and irreplaceable, there is the enhanced value of learning in the direct apprenticeship model. The University of Kentucky faculty sought to experience gross anatomy—their own field of expertise—in a different state, at a different university, in a different laboratory. When thinking of the training of professional anatomists as an apprenticeship model, it stands to reason that one can only learn as much as their mentors know. By seeking out additional mentors, we have the opportunity to expand both our didactic knowledge as well as our more ephemeral knowledge. For example, were it not for this collaboration, the University of Kentucky faculty would have been unaware that they refer to the donor bodies at Vanderbilt University as “silent learning partners.” Now, at the University of Kentucky, while that exact moniker has not been adopted, there has been a targeted shift to calling the individuals being studied in the laboratory “donors” instead of “cadavers.” This small shift in nomenclature is among several ways in which anatomists can facilitate more active contemplation of the tremendous gift of the donor. As eloquently summarized in a student account of the human dissection experience, one learner wrote: “To us, your silence speaks volumes. Your unrelenting patience humbles us all. The knowledge you impart, like fire, consumes” (Souza et al., 2020).

Ten Cate and Durning build upon the benefits of the apprenticeship model in medical education (which we extrapolate to classical anatomy training) in the following excerpt:

“In history, medicine has long been practiced and learned in apprentice–expert arrangements. Many generations have acquired competence in our profession by joining the guild structure of personal guidance. As medicine is a profession that arguably can only be transmitted by members of the profession, teaching and learning should go hand in hand” (Ten Cate & Durning, 2007).

The benefit of this experience has been to expand faculty experiences and toolkits by traveling to a new environment. The authors advocate for physical travel to a novel space for several reasons. First, for the purpose of normalizing self-selected post-graduate professional training that is focused on inter-institutional faculty development, in terms of professional development and exchange of innovative curricular ideas. Formal training in anatomy content typically concludes with the completion of the advanced degree and/or post-doctoral/fellowship learning opportunities. Following these credentials, individuals typically begin academic appointments at an instructor or assistant professor rank. Further on-the-job training may be dependent on the department/college collegial dynamics and teamwork offered at the institution. The opportunities to travel for the purposes of experiencing a new classroom environment and culture are less common in this post-formal training position, compared to travel with the express goal of learning a new laboratory research technique. Though teaching development programs lend themselves to virtual delivery methods more readily than bench research initiatives, the added benefits of traveling to an institution to experience the learning space in real time are more tangible than one might expect. For example, observing the nuances of the faculty-faculty and faculty-student interactions provides a framework for comparing teaching approaches between institutions and highlights points of symmetry and areas that differ substantially. This provides a reflective approach toward modifying existing content at the visitor’s home institution, as they have experienced the teaching/learning activity first-hand. This experience allows for reciprocity of benefits—the faculty at the host and visitor institution learn something new. While other programs such as the Anatomy Training Program sponsored by the American Association for Anatomists (AAA) and Anatomical Society (AS) from the United Kingdom (Rizzolo & Drake, 2008) focus on relatively new learners (particularly those from biomedical fields other than anatomy), the SEC program focused on faculty-faculty experiential learning, and in the spirit of the SEC program, fostering relationships that stimulate long-term collaboration on scholarly efforts. However, perhaps the benefits of “traveling” to an institution can also be simulated to some degree with virtual partnerships, such as virtual faculty exchange...
A second major goal of this interchange of ideas was to enhance the gross anatomy experience for medical and other allied health professions students in our courses. One component of this goal was the increased emphasis on peer teaching. Peer teaching is lauded for improving student motivation and enhancing learning outcomes through a variety of means, especially for the peer teacher (Bene & Bergus, 2014). Interestingly, a systematic review of this topic suggests that peer-taught learners learn at least as well as faculty-taught learners—and no studies in this review found worse outcomes for peer-taught learners (Yu et al., 2011). Ten Cate and Durning propose no fewer than a dozen advantages in favor of incorporating peer-taught learners (Yu et al., 2011). Ten Cate and Durning propose no fewer than a dozen advantages in favor of incorporating peer teaching into medical curricula, such as training leadership skills, preparing physicians as future educators, and even alleviating demands on teaching faculty (Ten Cate & Durning, 2007). Peer teaching is not uncommon in gross anatomy settings (Krych et al., 2005; Youdas et al., 2008; Agius et al., 2018; Eppler et al., 2018). Future work will aim to increase and formalize the peer teaching component of the Applied Human Anatomy course at the University of Kentucky.

The second component of this focus on enhancing the learning experience was a slight reimagining of the dissection approach. Instead of full-body dissection, students were assigned a specific region of emphasis to study. As evidenced in the qualitative comments, student feedback was very positive about the dissection approach applied in the course at the University of Kentucky. Of interest, several students who commented about the independently driven work they were able to do in the anatomy laboratory also commended the anatomy faculty for their support (Table 1). This ties directly into the concept of learning in an apprenticeship model, in which having an approachable and knowledgeable teacher are crucial to trainee success (Straus et al., 2013). In time, the apprentice becomes a journeyman who takes on trainees of their own, perpetuating a cycle of learning. Effective journeymen become effective masters, who can then continue training the next generation.

Apart from the expected benefits in content mastery that human donor dissection provides, the learning in the laboratory extends to intangible skills such as teamwork and coping with the idea of death (Flack & Nicholson, 2018). Furthermore, many facets of medical ethics can be appreciated through the study of the human donor, such as consent, beneficence, and dignity (Stephens et al., 2019) as well as concepts of professionalism beginning in early medical training (Lachman & Pawlina, 2006). Some studies of allied health practitioners demonstrate overwhelming clinician support of gross anatomy training (Latman & Lanier, 2001; Schofield, 2014). If we, as educators who specialize in the teaching of human gross anatomy do not voice our support for the continued study of the human body in a dissection-based approach, then who will encourage the field to prosper in the future? It is easy to note that gross anatomy is expensive, time-consuming, and often messy work. Why, though, is it not also easy to point out what a beautiful, irreplaceable, and often perspective-changing experience it can be for students (Pearson, 2020)?

Adding to the importance of apprenticeship and peer teaching, networking is another notable force in life-long learning. There is little debate about the intrinsic and irreplaceable value of in-person exchange of ideas, whether it be collegial interchange or student-teacher interactions. Covid-19 has impacted both of these things in the context of the work described in this article. Regarding the value of scientific conferences, Gregory Petsko’s words from 2006 are far more poignant now than he possibly could have realized at the time of his writing them: “And in a world that increasingly makes it easy to closet ourselves off from other people and receive our input from the computer screen—something many scientists are perhaps too fond of as it is—conferences are also our lifeline to the human side of our profession” (Petsko, 2006). In contrast, hosting exclusively in-person conferences has a number of negative impacts: large carbon dioxide footprint, costly registration and travel, and the fact that they tend to be inequitable (Sarabipour et al., 2021). Indeed, a recent poll of Nature readers shows that 75% of respondents hope that some virtual component/option continues to be offered in future conferences (Boscolo-Berto, et al., 2021; Remmel, 2021). This complex interplay of virtual and in-person attendees will continue to evolve in the coming years, but early sentiments indicate that the pandemic has unlocked the door to the “both/and” conference scenarios, where a hybrid format is more of the norm in which participants have a choice of attendance modality (Dua et al., 2021). In addition to the effects on scientific conferences, courses around the world were abruptly transitioned to online methods of delivery in March 2020. The broad negative impact of these shutdowns on student’s emotional and mental well-being is only just beginning to be explored (Son et al., 2020; Lee et al., 2021; Wilson et al., 2021). Certainly, neither schools of medicine nor graduate medical training programs were exempted from this shutdown, and a rapid transition to remote learning ensued (Krasowski et al., 2021; Teele et al., 2021). Though, as the University of Kentucky and Vanderbilt University had resumed some degree of in-person learning by the Fall of 2020, the courses described herein went on largely unchanged regarding the virus-induced restrictions. The faculty at the University of Kentucky was fortunate, as the space capacity limit on the anatomy laboratory was set at 30 individuals, and the Fall 2020 cohort only consisted of 16 students. Tables were spaced farther apart, extra personal protective equipment was worn, and the course went on. Various anatomy programs across the country were greatly innovative in the ways that they facilitated the return of students to the laboratory, from hanging plexiglass dividers to an increasing number of dissection groups to meet space capacity restrictions (Harmon et al., 2021).

The major interruption to the SEC Faculty Travel Grant program, on the other hand, was a much greater impairment, given that the very heart of the program is rooted in faculty travel between SEC universities. Nevertheless, both institutions have benefitted and continue to benefit from this ongoing communication and collaboration that was born of the SEC Faculty Travel program.
Limitations of the study

This work is limited by the fact that it was not designed as an empirical research project. There were no prescribed intervention variables nor was there a hypothesis driving the study design. Future work should separate students into intervention cohorts to examine the effects of regional body dissection of all donor regions concurrently (versus all students working within one region only at a given donor). The more empirical analysis is warranted to study the impact of dissection versus prosecution, dissection versus digital modalities, and less time for basic anatomy content in general.

The second set of limitations falls under the umbrella of logistical hurdles to implementation: future work should explore how this work can be replicated in larger cohorts. As an elective course, it is not anticipated there will be a major need to accommodate large enrollment at the University of Kentucky; course capacities could be set as needed, for example.

CONCLUSIONS

In conclusion, this gross anatomy quality-improvement collaboration during the time of Covid-19 has been extremely valuable to all its participants. Not only were tangible changes implemented in the course structure of the Applied Human Anatomy course at the University of Kentucky as a result of the interchange, but our perspectives were broadened by extra-curricular modifications such as the idea of the silent learning partner. The authors encourage others to embrace the apprenticeship nature of the field and seek out others in the relatively small cadre of gross anatomists with whom to exchange ideas in a more deliberate and profound way.

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