Teaching Philosophy – Aaron J. Hardgrave

I came to human anatomy as an outsider, and honestly, a reluctant one until I was well into my graduate career. After encouragement from Dr. Richard Carter and Dr. Michelle Chandley, I eventually enrolled in functional human anatomy alongside physical therapy and orthotics students. I was the lone PhD student in the course, the first in years, according to the faculty. At first it felt like a course that wasn't designed for me. Everyone around me was working toward clinical careers and thinking about patient outcomes, and I was a comparative morphologist who spent his days studying newts. But working toward the same goals around a shared cadaver has a way of breaking those distinctions down. When our group presented on the temporomandibular joint, my groupmates addressed clinical management and orthotic selection. I brought a finite element analysis study showing how stress distribution across the joint changes with different night guard geometries, and suddenly the clinical choice had a mechanical rationale behind it. I realized then that my perspective wasn't out of place at all. It just came from a different direction. That experience has shaped how I teach: anatomy is richer when different lenses are brought to the same structure, and my job is to help students find theirs.

My core teaching philosophy is simple: anatomy should be understood, not just memorized. The distinction matters because memorization fails under pressure. I saw this firsthand during the first module with Year 1 medical students covering the back. For many it was their first cadaver dissection, and the volume of information (muscle names, innervation, blood supply, function) was visibly overwhelming. Rather than push through the list, I walked them through an exercise focused on fiber orientation, origin, and insertion points, and asked them to infer function from what they were seeing in front of them. It wasn't a sudden revelation for most of them. But over the rest of the anatomy semester, several students told me they kept using that approach when they got stuck. That's what I'm after: not the dramatic lightbulb moment, but a way of thinking that travels with them.

What makes this approach work in anatomy specifically is that the evidence is right in front of the student. A textbook figure is an abstraction, and a table of origins and insertions is just information to be recalled. A cadaver is different. Students can trace a muscle from origin to insertion with their own hands, and then look down at their own body and feel it move. That immediacy is something no digital tool fully replicates, and I try to exploit it deliberately. I also meet students where they are. Many of my students were weightlifters or athletes, and I would tie muscle function to movements they already performed. The deltoid is a good example. It is a more complex muscle than it appears, yet it is targeted directly in many common gym exercises. I would walk students through its three compartments, working through the anterior, lateral, and posterior portions and discussing how the fiber orientation of each drives a distinct function. With a fanned out muscle like the deltoid, those distinctions are actually visible and traceable on the cadaver, and students can perform the movements themselves right there in the lab to feel each compartment engage. When students can anchor anatomy to their own bodies and experiences, it stops being a list of facts and starts being a framework for understanding movement. I teach students to compartmentalize by systems and regions, building a strong foundation in one area before advancing to the next. The extremities reward this particularly well: understanding the shoulder provides a framework for the arm, which in turn scaffolds the forearm and hand. These organizational habits extend well beyond anatomy into how students approach complex material throughout their education.

My teaching experience spans medical students, occupational therapy students, undergraduates, and high schoolers, and each population has required me to genuinely rethink how I present material rather than simply adjust the difficulty level. For M1 and M2 medical students, I integrated clinical case studies throughout laboratory instruction within a flipped classroom model, where students arrived prepared to apply their pre-class learning through dissection. The dissection format matters pedagogically because it is a process of discovery. Students encounter structures as they reveal themselves, building spatial understanding progressively as they work.

Teaching occupational therapy students required a fundamentally different approach. Rather than guiding students through dissection, they worked with prosected specimens, meaning they received the end result without the discovery process that medical students experienced. They rotated between anteriorly and posteriorly oriented cadavers and a models and osteology unit, which meant my time with each group was limited. To compensate for what the format couldn't provide, I ran supplemental instruction sessions outside of scheduled lab time. These weren't structured lectures. Students would come in, work through a region with me nearby, and I'd move through the material with them, letting them ask questions as we went and quizzing them along the way. Those sessions gave me something the lab rotation couldn't: a real sense of where each student was actually struggling and what they needed to hear to get unstuck.

Undergraduate and high school students required a different register entirely. In Biology I and II for majors and during the Governor's School program, I delivered traditional lectures enhanced with animations and incorporated substantial group work and student presentations. Peer teaching is underutilized in science education and I leaned into it deliberately, recognizing that being asked to explain something to a classmate surfaces gaps in understanding that a lecture never would.

Technology has a genuine but specific role in anatomy education, and I've learned to use it where it solves a real problem rather than as a default. The tool I rely on most is CompleteAnatomy, a 3D modeling app that allows structures to be isolated and visualized without the surrounding adipose and connective tissue that can obscure relationships in a cadaver lab. This is particularly useful for the brachial plexus. Students encounter the plexus first in lecture, but following individual branches through multiple regions on an actual cadaver is difficult. On CompleteAnatomy I can trace the median nerve continuously from its roots through the anterior forearm, through the carpal tunnel, out to its recurrent branch supplying the thenar muscles, and into its cutaneous distribution in the hand. The full clinical story of that nerve becomes visible in a way that's hard to achieve otherwise.

I've also used it to give students a mental model of structures they haven't yet dissected. During lower extremity anatomy, students hadn't yet encountered the posterior abdominal wall musculature, but the psoas and iliacus have meaningful effects on hip flexion and lower extremity mechanics. Showing those muscles on screen before students saw them in the cadaver gave them a framework to work from rather than encountering the structures cold.

That said, technology should solve problems, not replace the experience of working with an actual specimen. No app fully replicates the anatomical variation, tissue texture, and spatial relationships students encounter on a cadaver, and those encounters are the closest approximation to what they will face in surgical and clinical settings. My research background in µCT imaging and 3D reconstruction has sharpened my instincts for spatial relationships and model interpretation, and I bring that sensibility into how I use visualization tools in teaching. But the cadaver remains the foundation, and technology works best when it prepares students to engage with it more effectively.

Looking ahead, I am eager to contribute not just to existing curriculum but to developing new educational experiences that reflect where biomedical education is heading. One course concept I am particularly excited about is what I think of as a Digital Morphology course, aimed at students pursuing surgery, radiology, sports medicine, prosthetics, or any specialty where interpreting and analyzing anatomical structure at a detailed level is clinically meaningful. The premise is straightforward: using medical imaging and 3D reconstruction to develop a quantitative, computational literacy around anatomy that traditional gross anatomy courses don't cover.

The course could start simply. Open-source CT datasets are widely available, and with the right software students can begin working with real volumetric data almost immediately. At institutions with the resources and interest, students could scan the cadavers they are already dissecting, comparing what they see with their own hands to what appears in the 3D volume. That connection between physical specimen and digital model is something I find genuinely exciting as a teaching tool. As the course develops, additional imaging modalities such as MRI and PET could be incorporated depending on institutional resources and faculty expertise, giving students exposure to the full range of imaging tools they will encounter clinically and in the research literature. From there, the course could grow further through partnerships with surgical faculty and medical device collaborators, potentially incorporating implant and prosthetic design principles and finite element analysis of stress and strain distributions, helping students move from visualization into applied design and testing on cadaveric specimens.

I don't come to this idea abstractly. My opening paragraph describes a moment as a student where a finite element analysis paper changed how a room full of clinicians thought about a night guard. That connection between computational morphology and clinical decision-making is something I want to help more students experience. I'm excited to develop this kind of course collaboratively with faculty and institutional partners who share that interest, building something that aligns with the program's resources and vision rather than arriving with a fixed blueprint.