

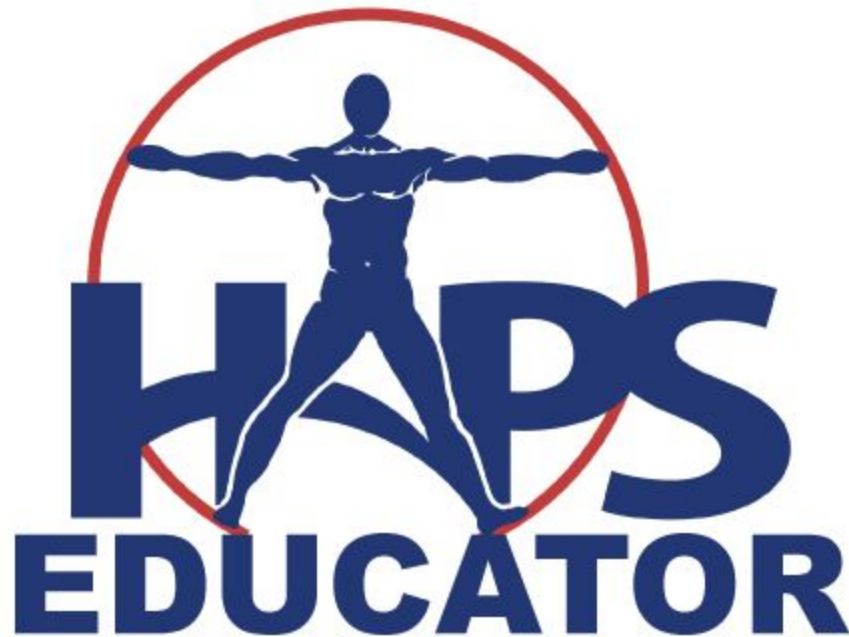
**Diversity and Inclusion in Anatomy and Physiology Education,  
Degree Programs, and Professional Societies**

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# Diversity and Inclusion in Anatomy and Physiology Education, Degree Programs, and Professional Societies

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## Abstract

Given the ever-increasing diversity of both the global and national community, diversity and inclusion are critical topics for consideration in healthy organizational settings. Promotion of diversity and inclusion is especially important for institutions of higher learning since diverse and inclusive environments more accurately teach learners about the real world, provide impetus for social change, and improve individuals' skills of cross-cultural interaction. The benefits of diversity and inclusion can be experienced in the anatomical sciences, including human anatomy and physiology, when course content has relevant connections to topics of diversity and when these topics are in alignment with standard learning goals or competencies. While some organizations, including anatomy and anatomy and physiology educators, have established policies, standards, or objectives for diversity and inclusion, there are many other professional societies relevant to anatomy and/or physiology that have not adopted such guidelines. Anatomy and anatomy and physiology educators also benefit from a more diverse working environment, multicultural interactions with other individuals at their institutions or professional meetings, and diversification of anatomy instruction in the classroom with effective technology and teaching methods. The applications of diversity and inclusion foster more culturally educated and enriched global societies and anatomy and physiology communities.

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**Key words:** diversity, inclusion, human anatomy and physiology, anatomical sciences, anatomy education

## Introduction

Diversity and inclusion have become popular topics in institutional climates. These topics have been important for the professional development of administrators and employees in many companies and other places of employment. According to Hays-Thomas and Bendick (2013), at least 50% of large entities boasting more than one hundred workers within the United States have diversity and inclusion initiatives and spend as much as \$10 billion per year on diversity and inclusion programming. Of course, this expense approximation is six years old, if not older. Today, even more employers have established diversity and inclusion departments or offices, and these spaces have proliferated, especially in institutions of higher learning. Aguirre and Martinez (2002) described diversity as "a social force in higher education that promotes the importance of understanding difference (e.g. cultural, racial, ethnic, etc.) in building a cohesive social fabric in society" (p. 54). The authors mention the words of Baez (2000) who stressed that when learners are instructed through the lens of diversity, they come to understand the global community, identify the areas in which equity can be improved, and acquire the skills necessary to resolve the barriers to equity for the world's citizens. Organizational communities of diverse individuals also have more leverage in contesting social hierarchies established

by society (Campbell 2000) and in providing constructive feedback and critiques (Aguirre and Martinez 2002) for institutional leadership and policies. Arguably, the college or university campus is one of the best settings to foster interactions among its diverse population of students, faculty, and staff. In fact, this cosmopolitan community is perhaps one of the most effective groups in effecting change in the greater community locally, regionally, nationally, or even globally through education, research, and the exchange of ideas.

Diversity and inclusion topics do not have to be confined only to the workplace, the workforce, and the campus environment at large. They can also be integrated into course curricular standards as well as the standards of professional societies specific to certain disciplines or fields. These types of standards can even be integrated into the anatomical sciences, such as human anatomy and physiology, so that they encourage and guide faculty in incorporating diversity and inclusion activities into their classrooms. They can also be implemented in professional societies, including those that govern undergraduate education, medical education, and specifically the anatomical and physiological sciences. This paper explains some ways in which diversity and inclusion activities can be included in anatomy classrooms and

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coursework, through “hot topic” themes. It also discusses the organizations that already have diversity and inclusion standards or guidelines as well as those that could further develop such standards. And finally, it addresses the current status of female and minority representation in the anatomical sciences and the importance of increasing and improving diversity and inclusion efforts in all of these areas.

### Diversity in the Classroom

Although racial and cultural diversity are increasing in institutions, inclusion does not necessarily always occur naturally. Humans have the tendency to interact with others with whom they share common characteristics, so institutions may have to use strategies that create more heterogeneous groups (Tienda 2013, McGlynn 2016) by challenging stereotypes (Crisp and Turner 2011). Stereotypes often serve as hindrances to diversity and inclusion efforts as preconceived notions or misconceptions that individuals have about entire groups might limit their willingness to interact with members of those groups. Thus, one course of action that can potentially dismantle or disarm such stereotypes simply involves exposing individuals to people with varying races, cultures, or ethnicities. For instance, teachers in the classroom can proactively organize their students into mixed groups that exhibit diversity (culturally, ethnically, racially, etc.). In fact, one study showed that such diverse groups improved students’ skills in interacting with other students unlike themselves simply because the courses incorporated assignments that involved heterogeneous group work and readings on topics of diversity (Engberg and Hurtado 2011). Such instances of inclusion have the potential to foster learning gains in students (Tienda 2013). Nevertheless, some more homogeneous institutions, organizations, or classrooms might not exhibit a highly diversified community. In such cases, discussions, seminars, and/or activities are extremely valuable methods for introducing diversity and fostering an inclusive mindset. Therefore, there is a need to connect curricular activities to diversity and inclusion themes.

#### Types of Diversity

There are many different kinds of diversity. However, the various forms of diversity can be organized into basic themes or categories, including demographic diversity, experiential

Categories, or Themes	Identities	Types
Demographic diversity	Origin	Age
		Biological sex
		Ethnicity
		Gender
		Race
		Sexual orientation
Experiential diversity	Growth	Abilities
		Affinities
		Cultural
		Disabilities
		Hobbies
		Nationality
		Political views
		Religious, spiritual, or secular views
		Socioeconomic status
Cognitive diversity	Aspiration	Education
		Learning preferences
		Occupation
		Spatial abilities

**Table 1.** *Types of Diversity.* This table displays various types of diversity according to three general themes or categories of diversity and to three basic identities to which individuals ascribe. These themes and identities were assembled from an article by de Anca and Aragón (2018). The types have been assigned to them by the authors of this paper, but they do not represent an exhaustive list. A number of these types have been explored in the field of diversity and inclusion management (Theodorakopoulos and Budhwar 2015).

diversity, and cognitive diversity (de Anca and Aragón 2018). Table 1 provides a list of specific types of diversity organized under these more general categories, but this list is by no means an exhaustive list of all of the many forms of diversity. The discussion of these various forms of diversity is important as they appeal to individuals’ identities of origin, growth, and aspiration (de Anca and Aragón 2018). Highlighting these identities celebrates diversity and creates an environment of cultural awareness, sensitivity, and appreciation that promotes inclusion. The themes encompassing these types of diversity can be applied even to a field as specific as anatomy, through their application to “hot topics.”

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### *Diversity in Anatomy Education*

This section explores three general themes of diversity and provides general ideas for specific examples of how they can be incorporated into classroom activities that pertain to relevant topics in the fields of anatomy and human anatomy and physiology.

#### 1. Demographic Diversity

The theme of demographic diversity perhaps incorporates more types of diversity compared to the other themes mentioned in this paper. While excess detail is not allocated to the discussion of examples of each of the types outlined in Table 1, one example of how content pertaining to gender diversity can be incorporated into the classroom is described. The topic of gender diversity is arguably the hottest current topic in anatomy, especially given the controversy that discussions of gender have instigated in society. In fact, at the Experimental Biology Annual Meeting in San Diego, California, on April 21, 2018, the American Association of Anatomists (AAA), now known as the American Association for Anatomy (AAA), featured a symposium titled "The Anatomy of Gender" (Carter et al. 2018). In this symposium, two anatomists Drs. Yasmine Carter and Derek Harmon discussed the importance of including in medical curricula terminology pertaining to transgender and gender-nonconforming individuals, such as appropriate pronouns and terminology to use in patient interactions. In the same symposium a urologist, Dr. Maurice Garcia, described in detail the steps taken to conduct feminizing and masculinizing surgeries on patients desiring to undergo transition. Dr. Harmon also emphasized the importance of incorporating transgender anatomy into anatomy curricula, and Dr. Carter asserted the relevance of such content to the Liaison Committee for Medical Education (LCME) standards.

Instructors in anatomy and physiology or other anatomy courses can incorporate topics similar to those discussed in this symposium. Workshops pertaining to this content have also been conducted at two medical centers in the country, where Drs. Harmon and Garcia performed pelvic prosections portraying various stages of feminizing and masculinizing surgeries and led urology and obstetrics and gynecology residents in performing the surgical procedures themselves. Although the cost would be high, a similar workshop featuring prosections could also be done at undergraduate institutions for anatomy and physiology students. For lessons involving little or no expense, instructors could simply use visual presentations with diagrams and photos, and they could lead their students in discussions regarding the current literature on transgenderism. Such activities might also be beneficial for professional students in the health sciences since a recent review article has noted substantial knowledge gaps across medical subspecialties (Wanta and Unger 2017). Educators can also refer students to literature asserting the scientific difference between gender and biological sex (Zhou et al. 1995, Torgrimson and Minson 2005, Bao and Swaab

2011, Smith et al. 2015, Feusner et al. 2017) to help clear up any misconceptions that students might have concerning this difference which has been so controversial in society. Furthermore, educators can discuss various physiological differences that exist between males and females; knowledge that has only emerged fairly recently, beginning in the mid-1990s when women began to be included in clinical trials (Torgrimson and Minson 2005).

In anatomy and physiology courses, anatomy concerning gender can be an essential topic of diversity for a number of reasons. First of all, such discussions are important for students to have, especially since they likely will meet people who identify as trans individuals or who do not conform to a specific gender. Secondly, conversations surrounding gender increase individuals' sensitivity to characteristics that are different from their own. In addition, gender equality and equity are important considerations in creating a more diversified representation of female, trans, and other gender non-conforming individuals between student and workforce populations at institutions of higher learning. This fact is especially true since there is a discrepancy in the higher number of female students graduating from programs in the sciences and the lower number of female faculty obtaining jobs (Snyder et al. 2019). There are probably even smaller numbers of transgender, gender non-binary, or gender non-conforming individuals entering these programs as students or faculty, but the numbers are not currently reported in statistics since federal law still requires gender to be reported as the binary designations of "male" or "female," and since there is ambiguity as to whether the data and terminology represent gender, biological sex, or both (IPEDS 2017). The fields of anatomy and neuroscience can play instrumental roles in changing such an impractical law. Finally, since many of the students who take courses in either anatomy or physiology or combined anatomy and physiology courses ultimately intend to enroll in health professional programs, they must be aware of the varying terminology and anatomy among transgender individuals in various stages of transition as they may have interactions with such patients in the future.

Another example of content pertaining to demographic diversity involves racial diversity. For instance, given the racial demographics of Mississippi and its institutions like the University of Mississippi Medical Center (UMMC), activities of corresponding racial diversity can be included in undergraduate anatomy and physiology courses. For example, students learning about red blood cells could study the prevalence of sickle cell anemia in people of African descent and the evolutionary advantages the genetic trait offers to malaria resistance. In addition, further reading could feature the prevalence of thalassemia in Caucasians. Examples of evidence-based research might revolve around studies that analyze the predispositions of certain racial and socioeconomic groups to display health care disparities.

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For instance, in Mississippi, the Jackson Heart Study (JHS), the largest investigation of causes of cardiovascular disease in African Americans, has shown a higher prevalence of hypertension, coronary heart disease, stroke, heart failure, and peripheral arterial disease in African American males than their Caucasian counterparts (HHS 2019). Furthermore, anatomy and physiology instructors could organize students into small groups whereby students might discuss the factors contributing to higher risks of diseases in particular racial or ethnic groups, such as heredity, access to healthy foods, or other factors. Therefore, if the demographics of the students in their classes are different, instructors could incorporate diversity content relevant to the ethnic, racial, or other cultural groups represented by their particular students, or they can discuss content pertaining to multicultural groups that are different from the ones represented in their classrooms. In this respect, instructors are able to integrate diversity in classrooms, even if their student cohorts lack racial or ethnic diversity.

## 2. Experiential Diversity

In addition to incorporating content pertaining to topics of demographic diversity, instructors can incorporate content pertaining to topics of experiential diversity into their classrooms. One such topic regarding the ethical considerations of body donation programs and the use of anatomical donors and other cadaveric materials has implications with religious, spiritual, and secular diversity and has high relevance in anatomy education. Instructors in human anatomy or human anatomy and physiology courses can address the implications when they discuss topics such as respect for human tissue or for the human as a whole (Murray 1986, Lella and Pawluch 1988, Upshur et al. 2007, Satyapal 2012). Instructors can also facilitate conversations about the treatment of the human body from the vantage point of different religious beliefs (Daar 1994, Daar 1997, Raza and Hedayat 2004, Park et al. 2011). Another emerging hot topic that can entail religious and spiritual undertones is the anxiety associated with the fear of death and dying (Howells et al. 1986, Black et al. 1989, Williams et al. 2005, Thiemann et al. 2015). Sara Klender, a colleague and current graduate student at UMMC, has begun to explore the fear of death among dental students and its impact on their performance in gross anatomy (Klender et al. 2019). She intends to conduct her dissertation research on this topic while exploring potential ways of alleviating this anxiety among both dental and medical students; many of whom confront real human donors for the first time in their gross anatomy courses. Such research can also instill within all students who work with cadavers, not just medical students, a more authentic understanding of mortality and respect for the dignity of the human body.

The two main topics that are often considered taboo for intellectual discourse are religion and politics. However, religious and political values are indeed those ideas which

govern important aspects of human activity, such as the daily functioning of a college or university, legislation concerning gender equity and other forms of social justice, and the use of human specimens in the education of students in the health sciences. By having such difficult conversations, people not only learn how to formulate arguments which enable them to articulate their own diverse perspectives in an educational forum, but they also learn how to clarify misconceptions that they might have possessed regarding a particular religious belief or political ideology. Furthermore, people can develop a deeper respect for the religious or political beliefs of their colleagues or classmates by learning about them. For instance, Amberly Reynolds, a colleague and current graduate student at Indiana University, offered a workshop titled "A Native American Perspective on Medicine, Donors and Dying" at the most recent Human Anatomy and Physiology Society (HAPS) Annual Meeting. In her workshop, she presented the customs of the Navajo tribe, including the religious practices, tribal medicine rituals, and treatment of their dead. Should Navajo students work with the deceased, as in a Gross Anatomy Laboratory, they must undergo a cleansing ritual before interacting with family and crossing the home threshold. Understanding the spiritual beliefs that forbid students from handling the bodies of those who are no longer living can better prepare instructors and other students for respecting these students' potential wishes to abstain from handling deceased human tissue.

## 3. Cognitive Diversity

When discussing topics of diversity in the classroom, instructors can also consider topics pertaining to cognitive diversity in addition to demographic and experiential diversity. One form of cognitive diversity that instructors might want to incorporate into their instruction is occupational diversity, given the various professions relevant to the field of anatomy. Instructors might want to survey their students to obtain a better idea of which fields many of them want to pursue. Given the fact that many undergraduate students in human anatomy and physiology or human anatomy courses tend to have an affinity for the health sciences, instructors can incorporate content pertaining to medicine, nursing, nurse anesthesia, dentistry, pharmacy, occupational therapy, physical therapy, physician assistant, optometry, and/or mortuary science programs. Additional programs that might also have some varying degrees of relevancy to anatomy include anthropology and veterinary medicine. Since each discipline places different emphases on certain regions and systems of the body and on certain clinical skills that require more application of anatomy, instructors can design their courses to make corresponding curricular accommodations for their students. A diverse and inclusive approach to all or several of these disciplines in undergraduate classrooms might also help students make informed decisions about the careers they both do and do not want to pursue upon graduation.

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Another form of cognitive diversity that becomes especially important when studying anatomy both in the cadaveric lab and via computer-based virtual modalities is that revolving around individuals' spatial abilities. In fact, several studies have demonstrated that students with high spatial abilities perform better in completing complex tasks (Yang et al. 2003, Rusch 2008, Höffler, 2010, Riastuti et al., 2017) as well as in learning anatomy (Garg et al. 2001, Luursema et al. 2006 and 2008, Luursema and Verwey 2011, Nguyen et al. 2014, Berney et al. 2015, Cui et al. 2017) than their lower spatial ability counterparts. Anatomy instructors, therefore, should consider using instructional methods that help students with lower spatial abilities learn anatomy just as well as, if not better than, their high spatial ability counterparts. For instance, with the increase in virtual anatomy over the past few decades, there is a need to explore situations in which the use of cadavers or cadaveric material is more beneficial than virtual models or images and vice versa. Moreover, there is a need to examine situations in which two-dimensional (2D) images are more appropriate than three-dimensional (3D) images and vice versa and in which static images are more appropriate than movable images and vice versa. Furthermore, of the 3D images, instructors must consider when monoscopic and stereoscopic images are better, if at all. Monoscopic images refer to those that can be rotated in three dimensions on a flat screen while stereoscopic images refer to those that appear to "pop out" of the screen similar to a 3D movie.

A factor of spatial abilities known as spatial relation ability (SR), which refers to an individual's capacity to rotate 2D and 3D images in their mind rapidly and accurately, has a positive correlation with improved task performances (Berney et al. 2015). Individuals utilize SR when they must form mental representations of 3D objects (Berney et al. 2015), especially when those objects possess an internal anatomy of structures with identifiable 3D relationships to each other (Meyer 2019). The mental rotation test (MRT) has been classically used to measure individuals' SR (Shepard and Metzler 1971, Vandenberg and Kuse 1978, Peters et al. 1995), and the MRT items can be obtained from Peters et al. with permission and then used to assess students' or other individuals' SR. According to studies, low SR students learning with movable monoscopic (Berney et al. 2015) or stereoscopic visualizations performed just as well as high SR students (Luursema et al. 2006, Cui et al. 2017). These studies suggest that the movable visualizations accommodate low SR students (Mayer and Sims 1994, Hays 1996, Mayer 2002) but provide fewer gains for high SR students. Conversely, high SR students who learned with immovable 2D visualizations performed better than low SR students (Berney et al. 2015, Cui et al. 2017). In another study comparing two groups of first-year medical students learning from either monoscopic or stereoscopic middle and inner ear models, students with lower spatial ability had practically higher scores than their higher spatial ability colleagues, despite the lack of a significant difference

between the two (Meyer 2019). Instructors can gather data on their own students' spatial abilities and examine their performance after instructional interventions to determine which methods work optimally for their classes.

## Diversity and Inclusion Standards

A number of national and international professional societies and organizations that include members who are anatomy or anatomy and physiology instructors have adopted diversity and inclusion standards by which to govern their interactions with a diverse membership and to promote inclusive behaviors among their members. Appendix 1 provides a list of a few of these professional societies or organizations and their contributions to diversity and inclusion. However, this appendix table is, in no way, an exhaustive list of all of the societies and organizations in the health sciences that may contain members who are anatomy or anatomy and physiology educators. Details about the organizations that are not discussed in this section can be found by consulting Appendix 1 to learn more about their contributions to diversity and inclusion. Of the 49 professional societies or organizations included in the table, approximately 10% provided a set of standards or equivalent, approximately 27% provided a statement or equivalent, approximately 27% mentioned a committee or equivalent, and approximately 18% provided an official webpage with resources dedicated to diversity and inclusion.

### Quicklink to APPENDIX 1.

*Contributions of Anatomical and/or Physiological Societies*  
Of the professional societies specific to anatomy and/or physiology, the American Association for Anatomy (AAA) and the American Physiological Society (APS) appear to make the greatest contributions to diversity and inclusion. Unlike the AAA, the APS includes a set of diversity and inclusion policies as well as a webpage dedicated to diversity and inclusion resources. The AAA does have a fairly new Diversity and Inclusion Committee unlike the APS; however, the APS has a few committees dedicated to minority groups in the field of physiology. In addition, the Physiological Society (PS) has a set of diversity and inclusion objectives as well as a webpage featuring diversity and inclusion resources. In turn, while the Human Anatomy and Physiology Society (HAPS) does not have policies, standards, or objectives that explicitly address cultural competency or diversity and inclusion like the APS, it does have a set of learning goals (HAPS 2018) for anatomy and physiology students. As a matter of fact, the organization's broader process goals (Figure 1) provide an invitation for instructors to incorporate in their courses readings on diversity topics relevant to anatomy and physiology, anatomy and physiology research featuring diverse sample populations, and heterogeneous small-group collaborations. These course activities could exhibit any amount of variability depending on the location of the institutions where anatomy and

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physiology courses are offered. Some examples of activities or opportunities for incorporating diversity and inclusion topics into the classroom were discussed in a previous section.

#### *Contributions of Health Professional Societies*

Overall, medical centers or health science centers with medical schools seem to have taken the lead in promoting diversity and inclusion in the medical profession as well as in other healthcare fields. Many medical schools in the United Kingdom, the United States, and Canada have included diversity and inclusion competencies or standards in response to increasing diversity in populations (Dogra et al. 2009). Schools that are members of the Association of American Medical Colleges (AAMC) and the American Medical Association (AMA) have curricula that are governed by the Liaison Committee on Medical Education (LCME), which includes cultural competency in its standards (Figure 2) (LCME 2016). While this standard conveys the LCME's commitment to ensuring that medical students understand the importance of cultural diversity, there is certainly a lack of uniformity in the implementation of the standard among medical centers across the country. The AAMC and AMA are both featured in Appendix 1. In fact, through its website, the AAMC makes one of the most impressive contributions of resources devoted to diversity and inclusion (AAMC 2019). These resources can be freely accessed at any time to aid individuals in implementing or organizing diversity and inclusion programs of their own. Furthermore, the AAMC boasts diversity and inclusion as one of its missions with a Chief Diversity and Inclusion Officer and a team of other staff members under his leadership.

#### **Broader Process Goals**

*“The skills included in these goals should be developed while students are taking Anatomy and Physiology, but will also be reinforced in other curricular coursework. It is recommended that assignments and projects be used that develop these skills within the context of the fundamental content and process goals (1-8, above). The HAPS Curriculum and Instruction Committee has not linked these goals to specific learning outcomes in anatomy and physiology. Rather, the goals can be adapted to fit where the instructor feels they are most appropriate within the course content. There is no expectation of equal emphasis throughout all anatomy and physiology topics.*

9. Demonstrate information literacy skills to access, evaluate, and use resources to stay current in the fields of anatomy and physiology.
10. Approach and examine issues related to anatomy and physiology from an evidence-based perspective.
11. Communicate clearly and in a way that reflects knowledge and understanding of the human body and demonstrates the ability to adapt information to different audiences and applications.” (HAPS 2018)

**Figure 1.** Broader Process Goals of the Human Anatomy and Physiology Society (HAPS). These general goals allow the instructor room to modify his or her course learning objectives to promote not only depth of knowledge and application but also breadth of knowledge and application, perhaps for multidisciplinary connections such as diversity and inclusion.

#### **7.6 Cultural Competence and Health Care Disparities**

“The faculty of a medical school ensure that the medical curriculum provides opportunities for medical students to learn to recognize and appropriately address gender and cultural biases in themselves, in others, and in the health care delivery process. The medical curriculum includes instruction regarding the following:

- The manner in which people of diverse cultures and belief systems perceive health and illness and respond to various symptoms, diseases, and treatments
- The basic principles of culturally competent health care
- The recognition and development of solutions for health care disparities
- The importance of meeting the health care needs of medically underserved populations
- The development of core professional attributes (e.g., altruism, accountability) needed to provide effective care in a multidimensional and diverse society” (LCME 2016).

**Figure 2.** Liaison Committee on Medical Education (LCME) Standards for Cultural Competence. These standards are required to be included in the curricula of all medical schools that are members of the Association of American Medical Colleges (AAMC).

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Several of the professional societies representing other healthcare disciplines in Appendix 1 make varied contributions to diversity and inclusion on their websites. The field of nursing makes notable contributions. For instance, the American Academy of Nursing (AAN), American Association of Nurse Anesthetists (AANA), and the American Association of Nurse Practitioners (AANP) all have Diversity and Inclusion committees. Although the American Association of Colleges of Nursing (AACN) does not have a committee specifically dedicated to Diversity and Inclusion, it does have a Diversity, Equity, and Inclusion Group (DEIG). In addition, diversity and inclusion resources can be found on the websites of the AACN, AANP, and ANA as well as the Physician Assistant Education Association (PAEA). Of these other health professional societies, a set of policies, objectives, or goals can be found on the websites of the American Occupational Therapy Association (AOTA), PAEA, and American College of Radiology (ACR).

#### *Contributions of Other Professional Societies*

Among the other professional societies included in Appendix 1, noteworthy contributions to diversity and inclusion are made by the American Veterinary Medical Association (AVMA) and the Palaeontological Society (PS), both of which include statements of diversity and inclusion on their website. Moreover, the AVMA posts diversity and inclusion resources, and the PS has a Diversity and Inclusion Committee. While the American Association for the Advancement of Science (AAAS) and the Federation of American Societies for Experimental Biology (FASEB) do not include content relevant to Appendix 1 on their websites, they each make notable contributions to diversity. Both the AAAS and the Association of American Universities (AAU) produced a handbook on diversity and associated legal matters (Ham 2010), and the FASEB offers several federally funded opportunities through its Diversity Resources Program (FASEB 2017). There are certainly more organizations or professional societies relevant to anatomy and/or anatomy and physiology that are not discussed in this paper.

### **Diversity in the United States**

Since this paper mainly focuses on diversity and inclusion in anatomy education and professional development in the United States, considerations of the state of diversity in the United States as a whole are important. In this section, this article takes a closer look at the most recently reported statistics concerning racial and ethnic diversity as well as gender diversity in the United States. Many of these statistics specifically highlight the number of minorities and the number of women enrolling and graduating from anatomical and physiological programs with bachelor's, master's, and doctoral degrees. Unfortunately, there are no databases that report transgender, gender non-binary, and gender non-conforming individuals. For this reason, this section will describe these "male" and "female" designations as biological sex rather than gender since the actual gender of the individuals is not

clear. This section also explores the racial, ethnic, and gender diversity of students and faculty in baccalaureate and post-baccalaureate institutions where courses in human anatomy and/or human anatomy and physiology might be offered.

#### *The United States as a Whole*

From 2015 to 2016, all racial and ethnic minority groups proliferated faster than the Caucasian majority, thus demonstrating that racial and ethnic diversity in the United States is steadily increasing (Chappell 2017). The Census projects that more infants of color will be born in 2020 than white infants (Yoshinaga 2016). In fact, by 2045, Caucasians will be replaced as a minority comprising 49.7% of the population while the collective minority groups will comprise the majority (50.3%) of the population, including Hispanics (24.6%), Blacks (13.1%), Asians (7.9%), and multiracial individuals (3.8%) (Frey 2018). Given these estimations, efforts in improving and increasing diverse and inclusive interactions are paramount. A meta-analysis of college diversity experiences and civic engagement has shown that students who are exposed to diversity-related activities are more likely to develop civic-minded attitudes and to engage in civic behaviors (Bowman 2011). In addition, a study including survey data from over 15,000 students from 102 different institutions showed that a healthy institutional campus climate is dependent on racial and socioeconomic diversity (Park et al. 2013). Similarly, the more racial and socioeconomic diversity are promoted on any institution's campus, the greater the potential that the institutional climate will be improved even further. In fact, instructors who are especially passionate about diversity and inclusion might consider expanding diversity and inclusion activities beyond the anatomy and physiology or human anatomy classroom and into other areas of their institutional environments. Such efforts are extremely worthy given the underrepresentation of minority groups in baccalaureate and post-baccalaureate institutions.

#### *Diversity in Baccalaureate and Post-Baccalaureate Institutions*

This subsection presents information regarding the number of students enrolled in anatomy- and/or physiology-relevant programs in 2016 according to the most recent data from the Digest of Education Statistics 2017 (Snyder et al. 2019). It also presents the number of degrees conferred to bachelor's, master's, and doctoral students in these relevant disciplines in totality and then by race/ethnicity and sex in 2016. Furthermore, it presents the number of faculty employed by these institutions in totality and then by sex and race/ethnicity in 2016.

Upon general overview of the change in graduate enrollment in research-based programs in degree-granting post-secondary institutions, there has been an increase in the number of enrollees in the biological sciences over a ten-year period of time. According to the Digest of Education Statistics 2017, that number has increased from 15,898 students in 2007 to 16,380 students in 2016 (Snyder et al. 2019). In

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addition, when comparing the number of enrolled students during these two years, there have been enrollment increases in physiology (2,738 vs. 4,024) and in neurobiology and neuroscience (1,584 vs. 5,226) (Snyder et al. 2019). However, there has been a noticeable decrease in the number of enrolled students in anatomy (867 vs. 448) when comparing the number of enrolled students for 2007 and 2016 (Snyder et al. 2019). This decrease in the number of students entering anatomy programs throughout the country might play a role in the paucity of new classically trained anatomists at post-secondary institutions in the United States. The need for anatomy educators is not only experienced in the United States and Canada but also in the European Union (Wilson et al. 2019). Between 2017 and 2018 at medical schools in the United States alone, anatomy job postings increased more than two-fold, yet nearly a quarter were left unfilled (Wilson et al. 2019). The demand for more anatomy educators warrants the establishment of more programs for training anatomy scholars and educators not only for the sake of supplying the demand but also for the sake of increasing the diversity

of individuals within the field. If the number of individuals dwindles so too will the diversity.

The next set of tables were created from specific NCES data pertaining to the total number of anatomy- and physiology-related U.S. post-secondary degrees obtained by students, the number of those degrees according to race/ethnicity and sex, and the number of U.S. faculty according to race/ethnicity and sex (Snyder et al. 2019). Table 2 presents the total number of bachelor's, master's, and doctoral degrees in anatomy- and physiology-related programs according to sex conferred by post-secondary institutions at the culmination of the 2015-2016 academic year. Table 3 compares the number of bachelor's, master's, and doctoral degrees in the biological and biomedical sciences conferred by post-secondary institutions according to race/ethnicity and sex between the 2014-2015 and 2015-2016 academic years. Understandably, there is a discrepancy in the previously mentioned number of enrollees versus the number of graduates given the fact that not all who matriculate into degree programs graduate from them.

		Degree →			Bachelor's			Master's			Doctoral		
		Sex →			Male	Female	Total	Male	Female	Total	Male	Female	Total
Field & Program													
Anatomy	Anatomy	157	257	414	88	95	183	26	22	48			
	Cell Biology & Anatomy	2	3	5	17	15	32	27	31	58			
	Cell Biology & histology	193	244	437	12	19	31	58	74	132			
	Cell/Cellular Biology & Anatomical Sciences	61	68	129	67	69	136	62	70	132			
	Developmental Biology & Embryology	27	37	64	0	3	3	20	18	38			
	Neurobiology & Anatomy	347	450	797	5	9	14	48	39	87			
	<b>Total</b>	<b>787</b>	<b>1,059</b>	<b>1,846</b>	<b>189</b>	<b>210</b>	<b>399</b>	<b>241</b>	<b>254</b>	<b>495</b>			
Physiology	Cell Physiology	0	1	1	14	20	34	8	14	22			
	Exercise Physiology	1,507	1,810	3,317	135	177	312	35	37	72			
	Physiology, General	702	912	1,614	349	305	654	77	63	140			
	<b>Total</b>	<b>2,209</b>	<b>2,723</b>	<b>4,932</b>	<b>498</b>	<b>502</b>	<b>1,000</b>	<b>120</b>	<b>114</b>	<b>234</b>			
<b>Biological Sciences, General</b>		<b>27,889</b>	<b>45,152</b>	<b>73,041</b>	<b>1,402</b>	<b>2,043</b>	<b>3,445</b>	<b>420</b>	<b>522</b>	<b>942</b>			

**Table 2. Anatomy and Physiology Degrees Conferred by Post-Secondary Institutions in the United States According to Biological Sex in the 2015-2016 Academic Year.** This table represents the number of bachelor's, master's, and doctoral degrees conferred to both males and females and in total at the culmination of the 2015-2016 academic year (Snyder et al. 2019). The degrees are only those associated with programs in the anatomical, physiological, and general biological sciences. These data were collected from both private and public institutions.

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Race/Ethnicity →			B	H	A	PI	AI/ AN	2+ races	Min. Total	W	N-RA	Total
Yr.	Deg.	Sex										
2014-2015	Bach.	M	2,615	4,585	7,298	145	175	1,570	<b>16,388</b>	27,536	1,180	45,104
		F	5,684	7,003	9,614	144	264	2,358	<b>25,067</b>	38,014	1,719	64,800
		T	8,299	11,588	16,912	289	439	3,928	<b>41,455</b>	65,550	2,899	109,904
	Mast.	M & F	966	936	1,967	21	43	365	<b>4,298</b>	7,919	2,438	14,655
	Doct.	M & F	242	442	736	9	26	122	<b>1,577</b>	4,265	2,211	8,053
	<b>Total</b>			<b>9,507</b>	<b>12,966</b>	<b>19,615</b>	<b>319</b>	<b>508</b>	<b>4,415</b>	<b>47,330</b>	<b>77,734</b>	<b>7,548</b>
Race/Ethnicity →			B	H	A	PI	AI/ AN	2+ races	Min. Total	W	N-RA	Total
Yr.	Deg.	Sex										
2015-2016	Bach.	M	2,656	5,037	7,327	109	170	1,721	<b>17,020</b>	27,275	1,284	45,579
		F	6,134	7,834	9,997	129	304	2,535	<b>26,933</b>	39,281	1,956	68,170
		T	8,790	12,871	17,324	238	474	4,256	<b>43,953</b>	66,556	3,240	113,749
	Mast.	M & F	1,072	1,176	2,062	13	28	437	<b>4,788</b>	8,423	2,503	15,714
	Doct.	M & F	272	443	702	12	26	138	<b>1,593</b>	4,215	2,106	7,914
	<b>Total</b>			<b>10,134</b>	<b>14,490</b>	<b>20,088</b>	<b>263</b>	<b>528</b>	<b>4,831</b>	<b>50,334</b>	<b>79,194</b>	<b>7,849</b>
<b>Overall Total</b>			<b>19,641</b>	<b>27,456</b>	<b>39,703</b>	<b>582</b>	<b>1,036</b>	<b>9,246</b>	<b>97,664</b>	<b>156,928</b>	<b>15,397</b>	<b>269,989</b>

**Table 3. Biological and Biomedical Science Degrees Conferred by Post-Secondary Institutions in the United States According to Biological Sex and Race/Ethnicity in the 2014-2015 and 2015-2016 Academic Years.** This table represents the number of bachelor's, master's, and doctoral degrees conferred to both males and females at the culmination of the 2014-2015 and 2015-2016 academic years, respectively (Snyder et al. 2019). The NCES only reported data regarding the total number of bachelor's degrees for males and females separately. The total number of males and females receiving master's and doctoral degrees were reported together, but not separately. Specific data regarding the race/ethnicity of enrollees in anatomy and physiology programs were also not reported by the NCES, but since anatomy and physiology are included within the biomedical sciences, the numbers of students according to sex and race/ethnicity are embedded in the data within this table. The minority total represents the sum of the number of Black, Hispanic, Asian, Pacific Islander, and American Indian/Alaskan Native students as well as the number of students who identify with two or more races. These data were collected from both private and public institutions.

Yr. = Year; Deg. = Degree; Bach. = Bachelor's; Mast. = Master's; Doct. = Doctoral; M = male; F = female; T = Total; W = White; B = Black; H = Hispanic; A = Asian; PI = Pacific Islander; AI/AN = American Indian/Alaskan Native; 2+ races = two or more races; Min. = Minority; N-RA = non-resident alien

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Overall, there was approximately a one-percent increase in diversity in terms of the number of minorities receiving degrees between the 2014-2015 and 2015-2016 schools years. The only minority groups that experienced a decrease in the number of degrees conferred were the Pacific Islander male and female students as well as the American Indian/Alaskan Native male students. In addition, the number of White male students receiving degrees between these two academic years also decreased. Although the number of Black male students receiving degrees has increased, the rate of increase relative to the population of Black students is not very high. Further research could be aimed at exploring the reason for these decreases and low rates of increase for these respective groups.

In addition to the diversity of the students in post-secondary institutions, the diversity of the faculty is also analyzed. Table 4 presents the total number of faculty employed by post-secondary institutions in the United States in 2016 according to both race/ethnicity and sex. There has been an approximate 0.4-million decrease in the number of faculty employed by U.S. post-secondary institutions; approximately 1.5 million in 2016 and approximately 1.1 million in 2017 (Snyder et al. 2019). This decrease is likely due to the legislative cuts to government spending on education.

Nevertheless, when comparing the numbers of male and female faculty between 2005 and 2016, specifically, there has been a 9.9-percent increase in male faculty (714,453 vs. 785,157) and a 32.6-percent increase in female faculty (575,973 vs. 763,575) (Snyder et al. 2019). While such percentages bode well for diversity on the basis of sex, a closer look shows that the number of male faculty still outnumber the number of female faculty by over 20,000. Moreover, in 2016, male faculty on average were paid 21 percent more than female faculty (Snyder et al. 2019). The percentage of faculty represented by females in minority groups was two points higher than that represented by males in minority groups in 2016, and the total percentage of either males or females in minority groups was still below 25%. Although these statistics describe the overall landscape of diversity among all faculty within U.S. post-secondary institutions rather than only the diversity within anatomy- and physiology-relevant disciplines, these data still strongly suggest the need for further research in the diversity of the workforce in anatomical and/or physiological fields. Plus, if a lack of diversity exists on the basis of race/ethnicity and/or sex, measures for promoting more diverse and inclusive environments within individual departments should be explored.

R/E →	B	H	A	PI	AI/ AN	2+ races	Min. Total	N-RA	U/U	W	Total
Sex											
<b>M</b>	42,018	36,905	62,288	1,834	3,408	6,420	<b>152,873</b>	34,772	36,938	560,574	785,157
<b>F</b>	63,598	37,762	50,812	1,903	3,807	7,710	<b>165,592</b>	20,815	38,510	538,658	763,575
<b>T</b>	105,616	74,667	113,100	3,737	7,215	14,130	<b>318,465</b>	55,587	75,448	1,099,232	1,548,732

**Table 4. Faculty Employed by Post-Secondary Institutions in the United States in the 2015-2016 Academic Year According to Race/Ethnicity and Sex.** This table represents the number of faculty in all degree programs according to race/ethnicity and biological sex (Snyder et al. 2019). The NCES did not report data on faculty for each specific degree type or program. The minority total represents the sum of the number of Black, Hispanic, Asian, Pacific Islander, and American Indian/Alaskan Native faculty members as well as the number of faculty members who identify with two or more races. These data were collected from both private and public institutions.

R/E = Race/Ethnicity; M = Male; F = Female; T = Total; B = Black; H = Hispanic; A = Asian; PI = Pacific Islander; AI/AN = American Indian/Alaskan Native; 2+ races = two or more races; Min. = Minority; N-RA = non-resident alien; U/U = Unknown/Unreported; W = White

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## Fostering Diversity and Inclusion Within and Beyond the Classroom

Whether the settings are classrooms, departmental workspaces, conference seminars or meetings, or institutional offices or buildings, similar practices for promoting diversity and inclusion can be implemented in any environment. As long as personnel embrace ways of maintaining and further improving diversity and inclusion, diverse and inclusive atmospheres can flourish. The literature has revealed that diversity and inclusion are not the same and that promoting diversity within any group without also fostering inclusion is a moot point (Stevens et al. 2008, Stewart et al. 2008, Tienda 2013, Ferdman and Deane 2014, Sabharwal 2014, Ferdman 2017). Diversity and inclusion involve celebrating individuals' difference while simultaneously allowing individuals to feel a part of a group sharing in a common mission. The key then to authentic diversity and inclusion is finding the right balance in providing group members the often contradictory realities of a sense of belonging and the allowance of self-expression of unique identities (Ferdman 2010, Shore et al. 2011, Ferdman 2017). Any group can obtain this balance.

### *Within the Classroom*

In addition to expanding and elaborating on the classroom diversity activity examples provided earlier in this paper, instructors of anatomy or anatomy and physiology can establish inclusive classrooms in several ways. For instance, to foster inclusion, instructors can build rapport with their students through open conversation at the beginning and ending of class sessions, encourage student interactions by incorporating icebreakers into lessons, and facilitate small-group activities involving diverse student members (McGlynn 2016). Instructors can also utilize inclusive assessment methods to ensure a safe, equitable environment (Qualters 2016). Although the LCME and HAPS have made efforts to include either a standard (LCME 2016) or a broader process learning goal (HAPS 2018) in their curricular guidelines to guide the incorporation of cultural competencies into instruction, the LCME standard is not specific enough to define all that cultural competence entails, and the HAPS learning goal is too broad to address cultural competencies fully. In fact, none of the organizations researched in this paper have really established specific learning objectives or standards for diversity and inclusion that can be used to educate students in the programs corresponding to these societal members' institutions of higher learning. As a result, more effort needs to be invested by all professional societies with relevant anatomy and/or physiology content in the development and implementation of specific, measurable, attainable, realistic, and timely (SMART) diversity and inclusion goals or standards that will impact current and future learners. The policies, objectives, goals, or standards that are already possessed by some professional societies are mainly those used to drive the diversity and inclusion agenda among their membership, but not among the students that their members might teach,

### *Beyond the Classroom*

Outside of the classroom, a set of diversity and inclusion goals or standards that guide departments, institutions, or organizations in nurturing a community of diverse individuals who feel included is also important. While a number of professional societies mentioned in this paper have adopted Diversity and Inclusion statements, founded Diversity and Inclusion committees, and/or published or posted Diversity and Inclusion resources, there is still much room for growth and improvement within these organizations in addition to those that lack diversity and inclusion content on their websites.

The movement to embrace diversity and inclusion should also take place on departmental and institutional levels. Although many institutions and departments have made such efforts, readers should contemplate the level of effort that their own departments and institutions have dedicated to promoting diversity and inclusion for their stakeholders. A group of authors under the editorship of Ferdman and Deane (2014) have published a textbook that describes frameworks for comprehending inclusion and presents both individual and organizational perspectives and practices of diversity and inclusion. Departmental, institutional, or organizational members can find a wealth of helpful ideas for transforming the way their respective entities contemplate and apply diversity and inclusion principles. The text also mentions global diversity and inclusion standards that can be referenced by any department, institution, or organization that wants to launch its own Diversity and Inclusion program and then utilize it to measure its progress toward achieving five levels of benchmarks into which the thirteen diversity and inclusion categories are organized (O'Mara and Richter 2016). These resources can be consulted by any group relevant to anatomy or anatomy and physiology that wants to start, evaluate, and/or improve its diversity and inclusion program. Additional materials can be found on the websites of those organizations with diversity and inclusion resources outlined in Appendix 1.

## Diversity in Anatomy Today and Tomorrow

This section discusses the current status of this generation of students in general and the status in the field of anatomy, the potential directions toward which the field might expand in the future, the significance of cross-cultural interactions in the field, and the importance of professionals being well versed in the literature to provide the most relevant and practical learning experiences to students.

### *Teaching Tech-Savvy Learners*

Students born in the twenty-first century or even the late twentieth century, such as current undergraduate and professional students, have been immersed in the World Wide Web, smart phones, social media, and high-resolution graphics. These students have been aptly named the "digital generation." In fact, several authors have dubbed

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them “Digital Native” students whose ever-expanding technological demands must be met with newer computer-based innovations (Prensky 2001, Palfrey and Gasser 2008). In today’s world of rapidly evolving technology, various commercial entities compete for the attention of students and occupational consumers alike. With so many competing modes of communication and entertainment, faculty in institutions of higher learning must continue to be creative in their approaches to gaining and maintaining student interest in curricular learning opportunities. In fact, administrators often pressure faculty to use state-of-the-art computer-based equipment to diversify their traditional teaching. But, instructors, including those in anatomy or anatomy and physiology must remember that technology is only a tool and that it is only useful if it improves students’ learning. Thus, educators should continuously monitor and reflect upon their instruction and make adjustments when necessary.

#### *The Diversifying Landscape of Anatomical Research and Education*

Traditionally, research in anatomy has involved “bench science” research whereby the investigator might discover a new anatomical structure or explore the common anatomical variants that exist for various structures. Now, anatomy is evolving and, in a way, diversifying published research to include educational scholarship, applications to technologically-enhanced procedures and skills, and novel approaches to clinical anatomy. These areas of professional growth and advancement allow instructors to bring both current and cutting-edge content and strategies into their anatomy or anatomy and physiology curricula. Then, by conducting studies in their own classrooms and institutions, educators can analyze the results of their students’ performance and share them with a diverse global anatomical community.

There are a number of emerging anatomy programs that emphasize educational research in the anatomical sciences. The Clinical Anatomy Program at UMMC is one such program that has been in existence for only five years. Additional anatomy education programs exist at the University of Colorado Anschutz Medical Campus, Indiana University, the University of Nebraska Medical Center, and the University of Western Ontario, just to name a few. A more complete list of graduate programs in anatomy can be found on the American Association for Anatomy’s website (Rowan 2018). At these institutions, the scope of educational research topics ranges from assessment, learning strategies, technological innovations, curricular design, and more. These topics, which have been explored in gross anatomy, developmental anatomy, neuroanatomy, and histology courses for health professional students have also been explored in human anatomy and physiology courses for undergraduate students. Researches in all of these disciplines

have multiple opportunities each year to interact and network with one another at regional and annual meetings hosted by professional societies such as the American Association of Clinical Anatomists (AACA), the American Association for Anatomy (AAA), and the Human Anatomy and Physiology Society (HAPS).

#### *Cross-Cultural Interactions in Anatomy*

Today, advanced technology has established convenient communication via email, text messaging, social media, online blogs and open forums, teleconferences, and web meetings for people around the world. International anatomical societies have grown in popularity, and they provide platforms for researchers and educators from diverse groups to exchange ideas and discuss new findings and results. Such interactions allow attendees to establish cross-cultural collaborations that provide meaningful and unique insights into study designs and interpretations. Moreover, such studies that incorporate multiple global perspectives further enrich learning experiences and increase the robustness of studies.

An excellent opportunity for in-person international, cross-cultural interactions occurs every four-to-five years when the professional anatomy society composed of the majority of the anatomical associations around the world, the International Federation of Associations of Anatomists (IFAA), holds its Congress. The 19<sup>th</sup> Congress was held this year in London, United Kingdom, August 9-11, 2019. The society includes organizational members from around the globe. According to the information posted on the IFAA website (IFAA History 2019), the organization is comprised of nearly 50 member societies, and it is steadily growing. In 2024, the 20<sup>th</sup> Congress of the IFAA, was approved by the IFAA delegates to be held in Gwangju, South Korea. In addition, the Human Anatomy and Physiology Society will hold its 2020 annual conference in Ottawa, Canada. Dr. Kevin Petti, a HAPS member and anatomy and physiology instructor at San Diego Miramar College, offers a summer course called Connecting Art and Anatomy through the HAPS Institute, a platform for HAPS members to earn professional development (HAPS Institute 2019). During this twelve-day experience, students visit six cities in Italy where they examine renderings of the human body in painting and sculpture. Furthermore, members of the International Association of Medical Science Educators (IAMSE) have an opportunity to attend the IAMSE Integration in Medical and Health Science Education symposium in Kuala Lumpur, Malaysia, in February 2020, preceding the Association for the Study of Medical Education (ASME) Ottawa Conference. The Association for Medical Education in Europe (AMEE) is another society through which members can attend other international conferences. The 2019 AMEE Conference will be held in Vienna, Austria, in August, and the 2020 AMEE Conference will be held in Glasgow, United Kingdom, in September.

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Not all professionals in anatomy, however, have to travel thousands of miles for multicultural experiences in the field. Exposure to diversity and inclusion could be as simple as a mentor-mentee relationship, especially if the mentor and mentee represent two distinct cultural backgrounds. In this particular case, the authors of this paper are both American citizens. Nevertheless, while the first author (mentee) was born and raised in the United States, the senior author (advisor) was born and raised in China. Since English is the senior author's second language, this relationship has allowed the first author to assist in the review of grammar and spelling in manuscripts while the second author reviewed the scholarly content. This relationship has also allowed for cross-communication of the authors' differing heritages between one another. However, mentor-mentee relationships in which either the mentor or mentee is still learning the language of the other can take on many levels of diversity given the variety of languages and cultures possessed by students and faculty in the field of anatomy or anatomy and physiology.

#### *The Future of Anatomy Education*

With the advent of the technological age, students in colleges and professional schools are very different from students over twenty years ago, and they will continue to change. Instructors, including those in anatomy and/or physiology must continue to adapt and diversify their teaching by incorporating evidence-based instructional practices and being well versed in the literature to provide the most relevant and practical learning experiences to students, especially if they intend to be educators or healthcare providers in the future. The future success of anatomy as a field and of the anatomist or anatomy educator as a profession depends on this flexibility and response to ever-changing technology, knowledge, and student and faculty needs.

### **Conclusions**

Overall, the push for institutional policies for the promotion of diversity and inclusion both nationally and worldwide has been a positive endeavor that has improved and increased interactions between individuals of varying characteristics. Diversity and inclusion activities have the potential to foster such interactions in anatomy and anatomy and physiology classrooms. Several professional societies including anatomy or anatomy and physiology educators have made great strides in providing diversity and inclusion content on their websites, but there is much room for improvement in terms of these and other organizations' contributions to diversity and inclusion. The dwindling supply and growing demand for anatomy educators coupled with the current limited diversity in institutions of higher learning further amplifies the need for more diverse and inclusive anatomy education programs. Future efforts in diversity and inclusion have the potential to foster a more culturally sensitive and engaged community of anatomy and/or physiology educators as well as a global society of citizens who celebrate diversity and embrace each other in inclusive environments.

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## Appendix 1. The Status of Diversity and Inclusion Content on the Websites of Professional Societies and Organizations That Include Anatomists or Anatomy Educators.

Category or Classification		Organization or Professional Society	D & I Standards, Policies, or Objectives	D & I Mission or Vision Statement	D & I Committee or Task Force	Webpage or Website with Resources
Anatomy- and/or Physiology-Specific Professional Societies		American Association for Anatomy (AAA)	No	Yes	Committee	In Progress
		American Association of Clinical Anatomists (AACCA)	No	No	No	No
		American Association of Veterinary Anatomists (AAVA)	No	No	No	No
		American Physiological Society (APS)	Policies	Yes	No <sup>†</sup>	Yes
		Human Anatomy and Physiology Society (HAPS)	No <sup>††</sup>	Yes	Task Force	No
		International Federation of Associations of Anatomists (IFAA) <sup>†††</sup>	No	Yes	Yes	No
		The Physiological Society (PS)	Objectives	Yes	No	Yes
		Society of General Physiologists (SGP)	No	Yes	No	No
Health Professional Societies	Allied Health	American Association of Physician Assistants (AAPA)	No	No	No	No
		American Optometry Association (AOA)	No	No	No	No
		American Occupational Therapy Association (AOTA)	Policies	No	No	No
		American Physical Therapy Association (APTA)	No	No	No	No
		American Society of Radiologic Technologists (ASRT)	No	No	No	No
		Association of Schools and Colleges of Optometry (ASCO)	No	No	Committee*	No
		Physician Assistant Education Association (PAEA)	Objectives	No	Council**	Yes

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Category or Classification		Organization or Professional Society	D & I Standards, Policies, or Objectives	D & I Mission or Vision Statement	D & I Committee or Task Force	Webpage or Website with Resources
Health Professional Societies	Dentistry	Academy of General Dentistry (AGD)	No	No	No	No
		American Dental Association (ADA) <sup>***</sup>	No	Yes	No	No
	Medicine	American Association of Colleges of Osteopathic Medicine (AACOM)	No	No	Council and Committee	Yes
		American Medical Association (AMA)	No	No	No	No
		American College of Physicians (ACP) <sup>†</sup>	No	No	Sub-committee	No
		Association of American Medical Colleges (AAMC)	No (but through LCME)	Yes	Yes	Yes
	Nursing	American Academy of Nursing (AAN)	No	Yes	Committee	No
		American Association of Colleges of Nursing (AACN)	No	Yes (via diversity group)	Group <sup>††</sup>	Yes
		American Association of Nurse Anesthetists (AANA)	No	Yes	Committee	No
		American Association of Nurse Practitioners (AANP)	No	No	Committee	Resources (but no dedicated page)
		American Nurses Association (ANA)	No	No	No	Yes <sup>†††</sup>
	Pharmacy	American Association of Colleges of Pharmacy (AACCP)	No	No	No	No
		American College of Clinical Pharmacy (ACCP)	No	No	No	No
		American Pharmacists Association (APA)	No	No	No	No

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Category or Classification		Organization or Professional Society	D & I Standards, Policies, or Objectives	D & I Mission or Vision Statement	D & I Committee or Task Force	Webpage or Website with Resources
Health Professional Societies with Content Integrated into Anatomy Curricula	Pathology	American Society of Clinical Pathology (ASCP)*	No	No	No	No
		College of American Pathologists (CAP)	No	No	No	No
		United States and Canadian Academy of Pathology (USCAP)	No	No	No	No
	Radiology	American College of Radiology (ACR)**	Goals	Yes	Commission	Yes
		Association of University Radiologists (AUR)	No	No	No	No
		Radiological Society of North America (RSNA)	No	No	No	No
Mixed Basic and Clinical Science Professional Societies	American Assoc. for the Advancement of Science (AAAS)***	No	No	No	No	
	Federation of American Societies for Experimental Biology (FASEB)†	No	No	No	Yes	
	Generalists in Medical Education (GME)	No	No	No	No	
	International Association of Medical Science Educators (IAMSE)	No	No	No	No	

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Category or Classification	Organization or Professional Society	D & I Standards, Policies, or Objectives	D & I Mission or Vision Statement	D & I Committee or Task Force	Webpage or Website with Resources
Other Anatomy-Relevant Professional Societies	American Anthropological Association (AAA)	No	No	No**	No
	American College of Veterinary Surgeons (ACVS)	No	No	No	No
	American Society of Animal Science (ASAS)	No	No	No	No
	American Society of Embalmers (ASE)	No	No	No	No
	American Veterinary Medical Association (AVMA)	Yes	Yes	No	Yes
	National Funeral Directors Association (NFDA)	No	No	No	No
	National Funeral Directors and Morticians Association (NFDMA)	No	No	No	No
	Palaeontological Association (PA)***	No	No	No	No
	Paleontological Society (PS)	No	Yes	Yes	No
	Society for Medical Anthropology (SMA) <sup>†</sup>	No	No	No	No

This table does not represent an exhaustive list of all of the professional societies and organizations that might contain anatomists, anatomy educators, anatomy and physiology educators. This table also does not include many of the professional societies representing specialties or subspecialties within the various healthcare disciplines. In addition, this table mainly features national and international organizations whose headquarters are located in the United States, and while it does include a few organizations in Europe, it in no way represents all of the anatomical organizations within other countries nor does it represent all of the foreign organizations that might contain anatomists, anatomy educators, or anatomy and physiology educators. The citations for the website homepages of all the organizations included in this table are provided within the list of references in this paper.

<sup>†</sup>**Note:** While the American Physiological Society (APS) does not have a committee, task force, or interest group devoted to diversity and inclusion specifically, it does have a committee devoted to women in physiology and another devoted to minority affairs. In addition, the organization has an interest group including members engaged in sex and gender research in the field.

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**††Note:** Although the Human Anatomy and Physiology Society (HAPS) does not have official standards, policies, or objectives governing or guiding the implementation of diversity and inclusion activities or content delivery, it does include broader process goals beyond its learning goals posted on its website (HAPS 2018). These goals are broad enough to allow instructors flexibility to incorporate their own diversity and inclusion objectives in their classrooms.

**†††Note:** The International Federation of Associations of Anatomists (IFAA) is not an organization composed of individual members, but rather an organization composed of different anatomical professional societies throughout the world. It holds its congress once every five years. However, the organization does have a website and an officer team. For the sake of brevity, the anatomical associations in countries other than the United States were not included in this table. However, a list of these societies along with links to their respective websites can be found by visiting the IFAA website (IFAA Societies 2019). A number of these individual societies may post information pertaining to diversity and inclusion on their websites. While the IFAA does not have a Diversity and Inclusion Committee, it does have a Federative International Committee for Equality and Diversity in Anatomy (FICEDA).

**\*Note:** The Association of Schools and Colleges of Optometry (ASCO) has a Diversity and Cultural Competency Committee (DCCC).

**\*\*Note:** While the Physician Assistant Education Association (PAEA) does not have a committee of task force dedicated to diversity and inclusion, it does have a council dedicated to both endeavors. In addition, the organization has a Cultural Competencies Review Committee which is responsible for ensuring the promotion of cultural sensitivity among its members.

**\*\*\*Note:** There are a number of specialties within the field of dentistry, such as orthodontics and periodontics, but for the sake of brevity, the professional societies representing these specialties were not included in this table. Please feel free to search the web for a list of these additional organizations and their respective websites.

**‡Note:** Not included in this table is the American College of Surgeons (ACS). There are many organizations devoted to various surgical specialties in which anatomy is highly relevant; however, for the sake of brevity, these professional societies were not included in this table. Feel free to visit the website of the American College of Surgeons (ACS) to find a list of these additional organizations (ACS Other Surgical Societies of Interest 2019). This list may or may not be exhaustive.

**‡‡Note:** The American Association of Colleges of Nursing (AACN) has a Diversity, Equity, and Inclusion Group (DEIG) in place of a committee.

**‡‡‡Note:** While the American Nurses Association (ANA) does not have an official set of standards or policies, vision or mission statement, or committee dedicated to diversity and inclusion, it does have a webpage dedicated to Diversity Awareness on its website. Although this webpage is not dedicated to diversity and inclusion specifically, it does include resources pertaining to topics of diversity.

**•Note:** Although the American Society of Clinical Pathology (ASCP) does not include any of the content mentioned in the table on its website, it does host a Leadership Institute with an associated Certificate Program through which diversity and inclusion are one of the areas of leadership featured in the syllabus (ASCP Leadership Institute 2019).

**••Note:** The American College of Radiology (ACR) does not have a committee specifically devoted to diversity and inclusion, but it does have a Commission for Women and Diversity which has a set of goals, a statement on diversity and inclusion, and a webpage with resources. The commission also publishes an annual report titled “Diversity Report: Excellence Through Diversity and Inclusion” (ACR 2019).

**•••Note:** While the American Association for the Advancement of Science (AAAS) does not have policies, statements, committees, or a webpage with resources specifically devoted to diversity and inclusion, the organization in conjunction with the Association of American Universities (AAU) did release a comprehensive guide titled “Handbook on Diversity and the Law: Navigating a Complex Landscape to Foster Greater Faculty and Student Diversity in Higher Education” for establishing legally sustainable diversity programs for campuses in 2010 (Ham 2010).

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■Note: The Federation of American Societies for Experimental Biology (FASEB) is not composed of individual members, but rather multiple biological associations, such as the American Association for Anatomy (AAA). FASEB has a webpage devoted to its Diversity Resources Program. “The FASEB Diversity Resources Program is supported by grants from the National Institute of General Medical Sciences of the National Institutes of Health: Maximizing Access to Research Careers (MARC) Ancillary Training Program (T36) and Innovative Programs to Enhance Research Training (IPERT) (R25). [...] The FASEB Diversity Resources for Enrichment, Access and Mentoring (DREAM) activities (supported by MARC and IPERT grants) focus on skill development courses/workshops, structured mentoring activities and outreach programs which are designed to help create a highly skilled and diverse biomedical research workforce from all groups” (FASEB 2017).

■Note: Although the American Anthropological Association (AAA) does not have a committee specifically devoted to diversity and inclusion, it does have a committee known as the Members’ Programmatic, Advisory and Advocacy Committee (MPAAC) which focuses on issues of diversity and inclusion such as human rights, labor and work force, minority issues, and gender equity.

■Note: While the Palaeontological Association (PA) does not have content pertaining to diversity and inclusion on its website, the organization did hire a British company known as Parigen Limited to conduct a diversity study on the organization in 2018. This study (Council Diversity Group 2018) can be found on the organization’s website homepage.

▲Note: The Society for Medical Anthropology (SMA) is a section of the American Anthropological Association (AAA), but it does have its own website (SMA 2017).



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