

# Remembering Our Past: Teaching the History of Anatomy at Indiana University



**INDIANA UNIVERSITY**  
SCHOOL OF MEDICINE

<sup>1</sup>J.J. Brokaw, <sup>5</sup>H.M. Azim, <sup>1,2</sup>J.E. Bendinger, <sup>1</sup>K.T. Byers, <sup>4</sup>D.L. Dufeu, <sup>3</sup>D.C. Hanson, <sup>1</sup>J.M. Organ, <sup>1,2</sup>V.D. O’Loughlin

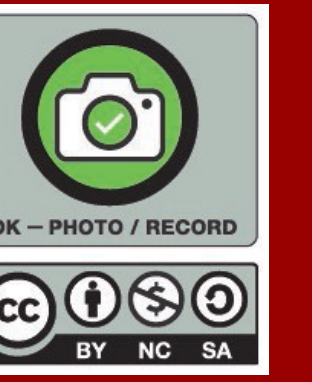
<sup>1</sup>Department of Anatomy, Cell Biology & Physiology, Indiana University School of Medicine, Indianapolis, IN

<sup>2</sup>Medical Sciences Program, Indiana University School of Medicine, Bloomington, IN

<sup>3</sup>Department of Anthropology, Indiana University, Bloomington, IN

<sup>4</sup>Marian University College of Osteopathic Medicine, Indianapolis, IN

<sup>5</sup>Department of Biomedical Education and Data Science, Lewis Katz School of Medicine, Philadelphia, PA



## ABSTRACT

Most students pursuing careers in anatomy or related disciplines have a limited understanding of how, over the centuries, the intricate structure of the human body came to be known. To provide students with the relevant historical perspective, we developed a team-taught survey course in the history of anatomical sciences—including gross anatomy, histology, neuroanatomy, and embryology—from antiquity to the present. Taught entirely via Zoom during the Spring semester of 2021, *History of Anatomy* (2 semester hours credit) met once per week for approximately 2 hours. Enrollment consisted of 5 undergraduate students majoring in Biology (2), Human Biology (2), or Anthropology (1), as well as 3 graduate students pursuing either a master’s degree in Clinical Anatomy (1) or a Ph.D. in Anatomy Education (2). Three of the students had no prior coursework in anatomy. Through assigned readings, lectures, and discussions, the class explored the work of the great anatomists and their discoveries. A particular emphasis was placed on the evolution of anatomy as a discipline and the cultural influences, scientific controversies, and ethical dilemmas facing its practitioners. Syllabus topics included critical appraisals of the role of gender, race, and ethnicity in anatomical discovery. A key feature of the course was the opportunity for students to engage in robust discussions about such controversial issues as: Eurocentric biases in our understanding of human anatomy and the untold story of Muslim contributions to anatomical knowledge well before Vesalius; Competing claims of priority for who “discovered” the pulmonary circulation; The underappreciated role of women in the history of anatomy and medicine; The ethical quandary of teaching anatomy from archival fetal specimens obtained before the era of informed consent; Accusations that famed anatomist William Hunter used the bodies of murdered pregnant women to create his anatomical atlas of the gravid uterus; Complicity of Eduard Pernkopf and other Nazi-era anatomists in the unethical use of executed victims to obtain images for a renowned anatomical atlas. All students were assessed through weekly homework (written responses to study questions), a mid-term writing assignment, and a term paper about an historical topic of the student’s choosing. Graduate students had the additional requirement of a class presentation about their term paper topic. The end-of-course evaluation suggested that the course was well-received by the students (mean Likert score = 4.63 on a 5-point scale; n = 6). Based on this positive reception, we plan to offer *History of Anatomy* again on a recurring basis. We believe that by knowing our history, both the good and the bad, future practitioners of anatomy and related disciplines will be less likely to perpetuate the biases and ethical transgressions of earlier eras.

## BACKGROUND

Students pursuing anatomy-focused careers often lack an understanding of how anatomy evolved as a discipline and how the prevailing religious beliefs, cultural influences, and social norms of each era influenced the advancement of anatomical knowledge. To provide students with the relevant historical perspective, we developed a survey course in the history of the anatomy from antiquity to the present. Through assigned readings, lectures, and discussions, the class explored the work of the great anatomists and their discoveries. A key feature of the course was the opportunity for students to engage in robust discussions about the controversial issues and ethical dilemmas facing anatomists, both past and present.

We report here our experience with the inaugural offering of **ANAT A361/D710 *History of Anatomy*** in the Spring semester of 2021. Taught entirely online via synchronous instruction (Zoom), the course met once per week for 2 hours, with an enrollment consisting of 5 advanced undergraduate students majoring in Biology (2), Human Biology (2), or Anthropology (1), as well as 3 graduate students pursuing either a master’s degree in Clinical Anatomy (1) or a Ph.D. in Anatomy Education (2). Three of the undergraduate students had no prior coursework in anatomy. 8 faculty members from 3 different institutions participated in this team-taught course.



Images courtesy of the National Library of Medicine

## COURSE LEARNING OBJECTIVES

- Summarize the major themes in anatomical thought from antiquity through the Middle Ages and explain why Aristotelian philosophy dominated medical beliefs for centuries.
- Contrast the works of Galen with those of Vesalius, and explain why his book, *De Humani Corporis Fabrica*, set the standard for anatomical scholarship in the Renaissance and paved the way for William Harvey and other experimentalists in future generations.
- Compare the life and times of the French barber-surgeon, Ambroise Pare, in the 16<sup>th</sup> century with those of the Scottish surgeon, John Hunter, who lived two centuries later. Both men are considered anatomy paragons of their respective eras. Support with evidence why you believe one or the other should be considered the more historically influential or “important” anatomist of the two.
- Discuss the prevailing attitudes (pro and con) about human dissection in 18<sup>th</sup> and 19<sup>th</sup> century Great Britain, and the conditions leading to the passage of the Anatomy Act in 1832. If you had lived during this time and were *opposed* to human dissection, what is the most persuasive argument could you make *against* the passage of the Anatomy Act.
- Explain how the development of the microscope established new domains for anatomy and give at least three examples of scientific controversies that were experimentally resolved with the microscope, e.g., the competing beliefs of Camillo Golgi and Santiago Ramon y Cajal about the structure of the nervous system.
- Provide an ethically-sound justification for the continued use of embryonic and fetal specimens in medical education even though they were collected before the era of informed consent.
- Give at least three examples of ways in which women uniquely contributed to anatomical knowledge and explain how taboos regarding the female body impacted medical education until the 20<sup>th</sup> century.
- Describe the controversies regarding Nazi-era anatomists and the allegations of unethical use of executed prisoners for their studies. Evaluate the evidence of their complicity and defend (or refute) why their work should be suppressed, e.g., Eduard Pernkopf’s atlas.

## COURSE TOPICS

Session	Topic
1	Course Introduction and Anatomy in Ancient Civilizations: Mesopotamia, Egypt, China, and India
2	Greek Contributions to Anatomy – 500 BCE to 50 BC
3	Anatomy in the Roman Empire – 50 BCE to 200 CE
4	Anatomy during the Middle Ages – 200 CE to 1452 CE
5	Anatomy during the Renaissance: From Leonardo to Vesalius (1452-1564)
6	Post-Vesalian Anatomy Reformers and Pioneers
7	The Rise of Experimental Anatomy and the Era of William Harvey
8	The Anatomical Legacy of the Hunter Brothers
9	The Procurement of Bodies: From Resurrectionists to Anatomy Acts
10	The Unsung Contributions of Women to Anatomy
11	Microscopy, Rise of the Cell Theory, and the Foundations of Histology
12	Knowledge and Ethical Considerations of Human Embryology
13	The Neuron Theory and the Birth of Neuroanatomy
14	Nazi Science and Other Ethical Transgressions in the History of Anatomy
15	Student Presentations

## COURSE REQUIREMENTS

Graded Activity	Value
<ul style="list-style-type: none"> <li><b>Class Participation</b> <ul style="list-style-type: none"> <li>Students are required to attend all 15 class sessions (2 hours each) and actively participate in the in-class discussions</li> </ul> </li> </ul>	<b>10%</b>
<ul style="list-style-type: none"> <li><b>Weekly Homework</b> <ul style="list-style-type: none"> <li>Each week’s reading assignment is accompanied by 4-6 discussion questions supplied by the instructor. Students are required to pick any two questions and submit brief written answers prior to class</li> </ul> </li> </ul>	<b>20%</b>
<ul style="list-style-type: none"> <li><b>Mid-Term Writing Assignment</b> <ul style="list-style-type: none"> <li>Students may choose to write 4-6 pages about either (1) some notable discovery or event in our understanding of human anatomy, with an explanation of its importance; or (2) a biographical sketch of a notable anatomist, describing the individual’s life and accomplishments in the context of the historical and cultural elements of the times in which they lived</li> </ul> </li> </ul>	<b>30%</b>
<ul style="list-style-type: none"> <li><b>Final Project</b> <ul style="list-style-type: none"> <li>All students write a 10-12 page term paper about any anatomically-related topic of their choice. Graduate students have the additional requirement of a 15 min PowerPoint presentation to the class</li> </ul> </li> </ul>	<b>40%</b>

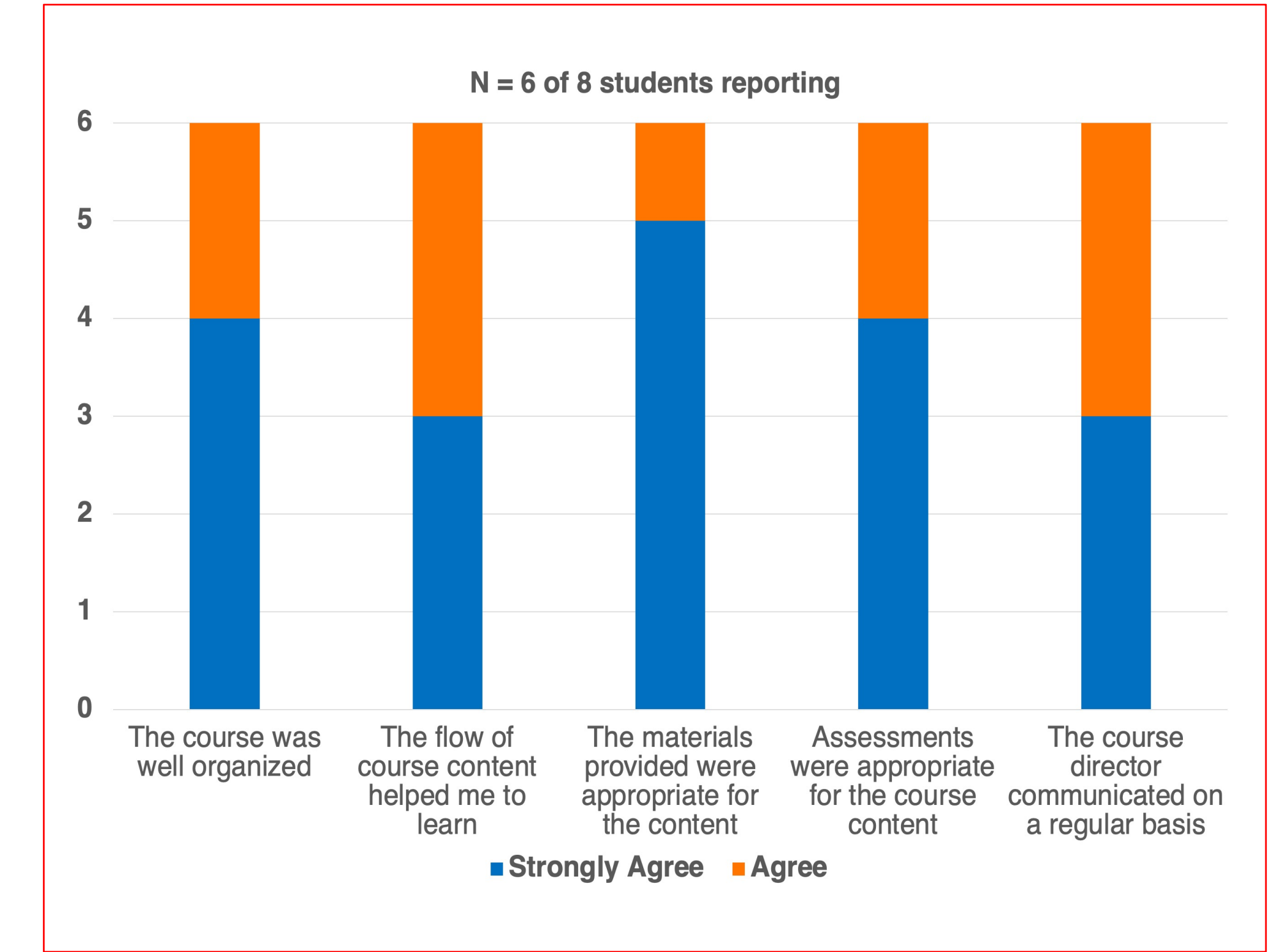
## EXAMPLES OF CLASS DISCUSSIONS

- Eurocentric biases in our understanding of human anatomy and the untold story of Muslim contributions to anatomical knowledge well before Vesalius
- Competing claims of priority for who actually “discovered” the pulmonary circulation
- Accusations that famed anatomist William Hunter used the bodies of murdered pregnant women to create his anatomical atlas of the gravid uterus published in 1774
- The controversial legacy of the surgeon Dr. J. Marion Sims, who operated on enslaved women in the mid 1800s
- Complicity of Eduard Pernkopf and other Nazi-era anatomists in the unethical use of executed victims to obtain images for a renowned anatomical atlas
- The ethical quandary of teaching anatomy from archival fetal specimens obtained before the era of informed consent

## TITLES OF STUDENT TERM PAPERS

- Anatomic Knowledge in Pre-Hispanic Mesoamerica: An Introduction*
- Black History and Anatomy: Notable Contributions and a Critical Look at Race in the Anatomical Sciences*
- Leonardo da Vinci: Contributions to Anatomy*
- Key Neuroanatomists’ Influence on Medicine After the Renaissance*
- The History of Public Dissections*
- Anatomical Theatres*
- Ancient Egyptian Religious Ideologies of the Soul in Regard to Mummification Techniques and the Outcome of the Brain*
- Galen & Anatomy in the Roman Empire*

## COURSE EVALUATION DATA



## STUDENT COMMENTS

*“I really liked this course! I think we covered a wide variety of topics that kept me always interested in the readings and the discussions. I would recommend more sessions with group discussion, but I think this will be easier in an in-person setting.”*

*“The content of the course was really good. Could have used some more direction on the midterm assignment and the final as far as a rubric or something.”*

*“The content was well suited however, maybe supplementing the textbook with other articles or books on topics of interest. The textbook at times was very superficial in content and often provided contradictory information.”*

*“This was a very cool class, and all of the professors and guest professors were very kind and were great at teaching their specialized subjects!”*

## CONCLUSIONS

- The Zoom format was well-suited for lecturing and facilitating in-class discussions.
- The weekly reading assignments (graded) promoted greater student engagement.
- The students took their classwork seriously and produced well-researched term papers, two of which are being presented as posters at EB 2022.
- Our positive experience teaching **History of Anatomy** last year has encouraged us to offer this course annually in the Spring semester.
- We believe this course may serve the needs of future practitioners of anatomy and related disciplines to better understand our shared history and in so doing avoid the biases and ethical lapses of the past.

## COURSE READING MATERIALS

- Persaud, T.V.N., Loukas, M., and Tubbs, R.S., *A History of Human Anatomy*, 2<sup>nd</sup> edition, Charles C. Thomas, Publisher, LTD., 2014.
- In addition to this textbook, approximately half of the weekly reading assignments were drawn from journal articles of the medical history literature.