



SCHOOL OF MEDICINE

INDIANA UNIVERSITY

Developing an Anatomy Education PhD Program: Key Lessons and National Trends

James J. Brokaw, PhD, MPH

Professor Emeritus of Anatomy and Cell Biology

Indiana University School of Medicine

Anatomy Education Research Institute

July 14, 2022



Presentation Outline

- Brief history of the Education Track PhD Program
- What was our rationale for the Education Track PhD program?
- How did we develop our program and gain university approval?
- What are some of the key lessons we learned?
- What does our Education Track curriculum look like?
- Where do our Education Track graduates go?
- How do we pay for our program?
- Have other schools developed similar programs?



Bloomington

Evansville

Fort Wayne

Indianapolis

Muncie

Northwest (Gary)

South Bend

Terre Haute

West Lafayette



The Education Track PhD Program in Anatomy: A Very Brief History

- The term “Education Track” is simply a short-hand way to distinguish it from our traditional bench research PhD curriculum or “Research Track.”
- The program was formally implemented in 2008 with the acceptance of our first student.
- Initially, the program was operated as a single program with a common curriculum and administration, but accepted students were assigned to either the Indianapolis or Bloomington campuses for the duration of their training.
- Beginning in 2018, the Bloomington campus was granted approval to offer its own Education Track PhD Program separate from Indianapolis.
- However, the curricula on each campus remain very similar and both programs coordinate their application/acceptance processes to minimize competition.



SCHOOL OF MEDICINE

INDIANA UNIVERSITY

Rationale for the Education Track PhD Program



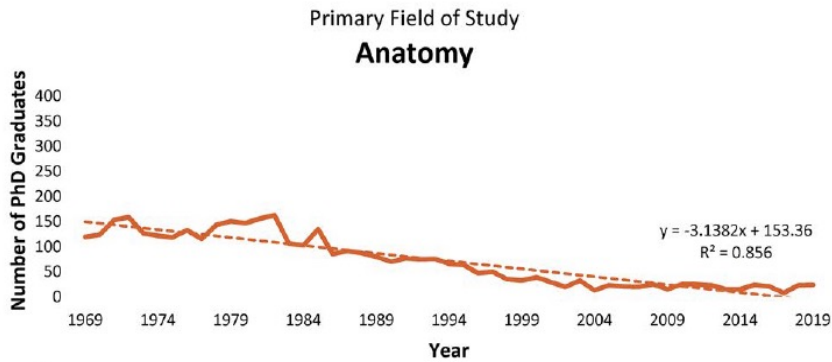
Shortage of Qualified Anatomy Educators

- Premise: Not enough classically-trained anatomists are being produced to meet future teaching needs in:
 - ✓ Gross Anatomy (greatest need)
 - ✓ Histology
 - ✓ Embryology
 - ✓ Neuroanatomy

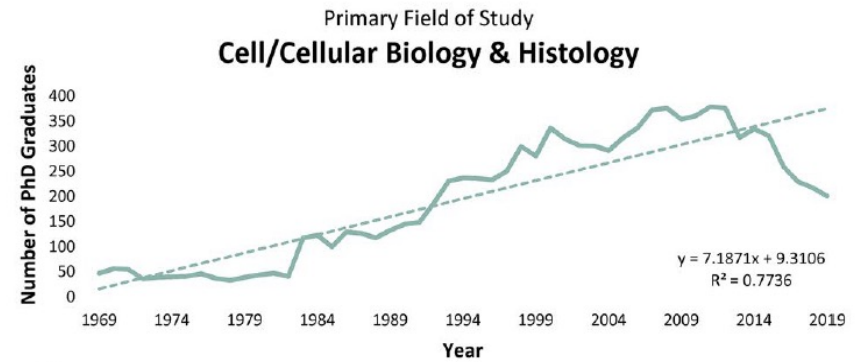


Is there evidence of a continuing shortage?

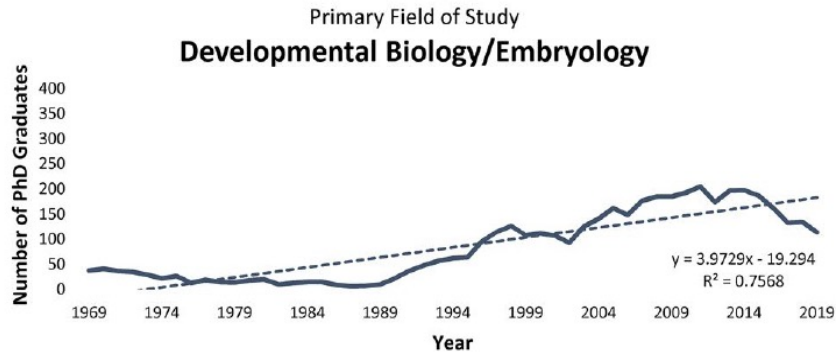
- In a recent survey of department leaders in the U.S., Canada, and European Union, the respondents anticipated having “moderate” to “great” difficulty recruiting faculty to teach gross anatomy (65%), histology (66%), embryology (70%), and neuroanatomy (48%) over the next five years.
- In the U.S., the number of anatomy educator job postings more than doubled from 21 postings in 2017 to 52 postings in 2018. 21% of these postings remained unfilled.



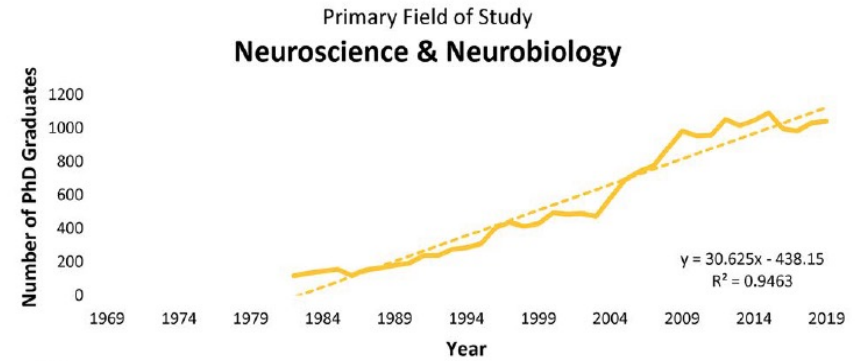
A



B



C



D

From: Wilson A.B., Kaza N., Singpurwalla D.J., Brooks W.S. Are Anatomy Programs Nearing Extinction or Adapting to Change? United States Graduate Education Trends in the Anatomical Sciences. *Anat Sci Educ* 14: 432-439, 2021.



Historical Trends Leading to Current Situation

Over the past several decades:

- Advances in medical science have increasingly focused on cellular and molecular biology research.
- Competition for graduate students has resulted in departments dropping requirements for taking and/or teaching gross anatomy or other anatomies.
- There has been little incentive to become involved in teaching gross anatomy in particular because of the heavy time commitment and distraction from bench research.



Growing Demand for Anatomy Educators

- All of these trends have been happening against a backdrop of a vast expansion in the number of new schools and programs in the health professions:
 - ✓ Allopathic and Osteopathic medical schools
 - ✓ Physician Assistant Programs
 - ✓ Doctor of Physical Therapy Programs
 - ✓ Doctor of Occupational Therapy Programs
 - ✓ Others
- In short, the supply of qualified anatomy teachers is not meeting the demand.



Institutional Strategies to Cope with Shortages

- Training junior faculty with cell or molecular biology backgrounds to teach the anatomical sciences
- Using more part-time or retired faculty
- Hiring biological anthropologists to teach gross anatomy
- Hiring clinicians (MDs, DOs, DPTs, PAs, etc.) or non-practicing international medical graduates
- Adoption of computer-based technology as an adjunct to traditional teaching, e.g., simulated dissections



Need for Educational Researchers in Anatomy

- Few anatomists are trained to conduct educational research and design curricula. By default, the role of “educational expert” in medical schools is being assumed by people who are not basic scientists, and who have little appreciation for anatomy.
- Medical education research is increasingly viewed by P & T committee as a legitimate scholarly pursuit for academic promotion.



Educational Research in the Era of Curricular Reform

- Medical schools are changing their curricula. Some common features include:
 - Active learning strategies (e.g., PBL, TBL) in place of lectures
 - Integration of content across the basic science disciplines
 - Elimination of discipline-based basic science courses
 - Organ systems-based curricula
 - Reduction in contact hours in the basic sciences, especially labs
 - Greater emphasis on “clinical relevance” in the basic sciences
 - Greater emphasis on medical student “competencies” like professionalism, interpersonal skills, etc.
- How will we know if any of these changes result in better educational outcomes and ultimately better doctors?



Goal of our Education Track PhD Program: Anatomist/Educational Researcher

- Teaches the anatomical disciplines to medical students and other health professions students
- Contributes original scholarship in medical education research
- Plays a vital role in the continuum of medical education within schools of medicine and other health professions



SCHOOL OF MEDICINE

INDIANA UNIVERSITY

Development of Education Track PhD Program



Important Early Steps: Sought Buy-In and Advice from Key Stakeholders

■ University Leadership

- ✓ Department of Anatomy and Cell Biology
- ✓ IU School of Education
- ✓ IU Graduate School

■ Consultants

- ✓ External advisory committee comprised of national leaders in educational research
- ✓ Executive Committee of AAA



Development Committee for Education Track Anatomy PhD

- James J. Brokaw, PhD, MPH – Anatomy, Indianapolis (Chair)
- Valerie D. O’Loughlin, PhD – Anatomy, Bloomington
- Robert L. Osgood, PhD – Education, Indianapolis
- Dale W. Saxon, PhD – Anatomy, Evansville
- Mark F. Seifert, PhD – Anatomy, Indianapolis
- Ronald L. Shew, PhD – Anatomy, Indianapolis
- Laura Torbeck, PhD – Surgery, Indianapolis
- James J. Walker, PhD – Anatomy, West Lafayette



External Advisory Committee for Education Track

- **Mark A. Albanese, PhD**

Professor of Population Health Sciences

Director of Medical Education Research and Development

University of Wisconsin School of Medicine and Public Health

- **Larry D. Gruppen, PhD**

Professor and Chair, Department of Medical Education

University of Michigan Medical School

- **Ilene B. Harris, PhD**

Professor of Medical Education

Director of Graduate Studies in Health Professions Education Leadership

University of Illinois College of Medicine in Chicago

- **Brian E. Mavis, PhD**

Associate Professor and Director, Office of Medical Education Research and Development

Michigan State University College of Human Medicine



Timeline for Education Track Approval Process

- Process Started: ~early 2006
- Anatomy Department: 11/17/06
- IUSM Graduate Division: 1/2/07
- IUPUI Graduate Affairs Committee: 3/27/07
- IU Graduate Council: 9/24/07
- IU Academic Leadership Council: 11/2/07
- First student matriculated: August 2008



Challenges and Key Lessons Learned

■ Criticisms to Overcome

- Perceived by some as a “teaching” degree rather than a research degree
- How can a science PhD be awarded for doing a “non-science” dissertation?

■ Key Elements of Success

- Buy-in from faculty
- Knowledgeable committee members
- Emphasis on academic rigor
- Support of leadership
- Collaboration with School of Education
- Viable funding mechanism
- Persistence and salesmanship



SCHOOL OF MEDICINE

INDIANA UNIVERSITY

The Education Track Curriculum



Guiding Principle for Education Track Curriculum

- The new curriculum must prepare the Anatomist/Educational Researcher not only to teach all of the anatomical disciplines, but to produce the scholarly work necessary for promotion and tenure



Two Equally-Important Curricular Components

- Broad training in the anatomical sciences with ample teaching experience
- A firm grounding in educational theory and methodology, coupled with the training needed to conduct rigorous educational research



Legacy Curriculum (2008-2015)

- **Medical Courses (25 cr.)**
 - **Gross Anatomy (8)**
 - **Histology (4)**
 - **Cellular & Molecular Biol (3)**
 - **Neuroscience (5)**
 - **Physiology (5)**

Current Curriculum (since 2016)

- **Medical Courses (28 cr.)**
 - **Human Structure (9)**
Gross anatomy, histology, embryology
 - **Molecules to Cells & Tissues (7)**
Biochemistry, cellular & molecular biology, genetics
 - **Neuroscience & Behavior (6)**
Neuroanatomy, neurophysiology, neuropharmacology, neuropathology, psychiatry
 - **Fund. of Health & Disease (6)**
Elements of physiology, pharmacology, pathology



Education Courses—Minor (18 hrs)

- Pedagogical Methods in the Health Sciences (3)
- Instruction in the Context of Curriculum (3)
- Learning and Cognition in Education (3)
- Qualitative Inquiry in Education (3)
- Methodological Approaches to Educational Inquiry (3)
- One course selected from list of advanced educational topics (3)

Statistics Courses (6 hrs)

- Intermediate Statistics Applied to Education (3)
- Multivariate Analysis in Educational Research (3)

Skills Development Courses (11 hrs)

- Anatomy Teaching Practicum (2); required teaching in all three disciplines (6 total)
- Educational Research Seminar (1); required yearly (5 total)

Electives (9 hrs)

- Courses in the biomedical sciences, education, or statistics selected in consultation with advisor

Dissertation Research (20 hrs)

- Sufficient credits to complete the 90-hour minimum degree requirement



- **Qualifying Examination**

A comprehensive written and oral examination, which includes the presentation of a dissertation research proposal in an extramural grant format.

- **Research and Dissertation**

Independent research in medical education, culminating in a written dissertation and oral defense

Dissertation committee includes faculty members from the School of Medicine and the School of Education



Education Track Graduates, 2013 – 2021

Name	Year Graduated	Faculty Location
Henkin, Katherine	2013	Creighton University School of Pharmacy & Health Professions, Omaha
Schaefer, Audra F.	2013	University of Mississippi Medical Center, Jackson
Wilson, Adam B.	2013	Rush University Medical Center, Chicago
Guillot, Gerard M.	2014	Medical College of Georgia, Augusta
Hoffman, Leslie A.	2014	Indiana University School of Medicine - Ft. Wayne
Fillmore, Erin P.	2015	University of Warwick Medical School, UK
Barger, John B.	2016	University of Alabama at Birmingham School of Medicine
Cassidy, Keely M.	2016	University of Nebraska Medical Center, Omaha
Byram, Jessica N.	2017	Indiana University School of Medicine - Indianapolis
Lloyd, Courtney J.	2017	University of St. Francis, Ft. Wayne, IN
Dunham, Stacey M.	2018	Indiana University School of Medicine - Bloomington
Klein, Barbie A.	2018	University of California San Francisco
Taylor, Melissa A.	2019	University of Tennessee Health Science Center, Memphis
Azim, Homaira M.	2020	Temple University School of Medicine, Philadelphia
Reynolds, Amberly M.	2020	Rocky Vista University College of Osteopathic Medicine, Ivins, UT
Smith, Theodore C.	2020	Touro University College of Osteopathic Medicine, Vallejo, CA
Helbling, Shannon A.	2021	Washington State University College of Medicine, Spokane



Education Track Dissertation Titles, 2013 – 2021

- Remediation Trends in an Undergraduate Anatomy Course and Assessment of an Anatomy Supplemental Study Skills Course (Audra F. Schutte, 2013)
- A Psychometric Evaluation of Script Concordance Tests for Measuring Clinical Reasoning (Adam B. Wilson, 2013)
- Understanding Interprofessional Education: A Multiple Case Study of Students, Faculty, and Administrators (Katherine Henkin, 2013).
- An Exploration of Reflective Writing and Self-Assessments to Explain Professionalism Lapses Among Medical Students (Leslie A. Hoffman, 2014)
- Does time matter? A search for meaningful medical school faculty cohorts (Gerard M. Guillot, 2014)
- Grit and Beliefs About Intelligence: The Relationship and Role These Factors Play in the Self-Regulatory Processes Involved in Medical Students Learning Gross Anatomy (Erin P. Fillmore, 2015)
- Visual Literacy in Anatomy Students (J. Bradley Barger, 2016)
- Embryology in Medical Education: A Mixed Methods Study and Phenomenology of Faculty and First Year Medical Students (Keely M. Cassidy, 2016)
- “Do I *Really* Have to Complete Another Evaluation?” Exploring Relationships Among Physicians’ Evaluative Load, Evaluative Strain, and the Quality of Clinical Clerkship Evaluations (Courtney J. Traser, 2017)



Dissertation Titles Continued

- The Professionalization of Medical Students: A Longitudinal Analysis of How Professional Identity is Formed in Second and Third Year Medical Students (Jessica N. Byram, 2017)
- Changes to Student Perceptions and Student Learning with the Implementation of Reciprocal Peer Teaching and Self-Directed Learning in the Gross Anatomy Laboratory: A Mixed Methods Study (Stacey M. Dunham, 2018)
- Exploring the Impact of Simulated Clinical Experience on Competence and Self-Efficacy in Medical Education: A Case Study of a High-Fidelity Simulation Center (Barbie A. Klein, 2018)
- The Impact of Medical Education Reform on the Teaching and Learning of the Anatomical Sciences (Melissa A. Taylor, 2019)
- A Foucauldian Archaeology of the Modern Medical Discourse (Homaira M. Azim, 2020)
- Pre-Nursing Student Progression Towards Admissions to Nursing School at Indiana University Bloomington: A Mixed-Methods Study Exploring Anatomy Coursework as a Prerequisite for Admission (Amberly M. Reynolds, 2020)
- Neural Basis of Anatomical Knowledge in Undergraduate Anatomy Students and Experts Using fMRI (Theodore C. Smith, 2020)
- Three-dimensional Visualization Technology in the Medical Curriculum: Exploring Faculty Use in Preclinical, Clinical, and Postgraduate Anatomy Education (Shannon A. Helbling, 2021)



SCHOOL OF MEDICINE

INDIANA UNIVERSITY

How do we pay for our program?



The Funding Challenge

Annual Cost to the Department Per Education Track Student at the Indianapolis Campus:

- **Stipend:** \$31,500 (NIH standard)
- **Tuition/fees:** \$9,360 (24 credits per year, the minimum for full-time status)
- **Health Insurance:** \$3,460
- **Incidental Costs (e.g., travel):** ~\$1,500

Total: at least \$45,820 per student per year



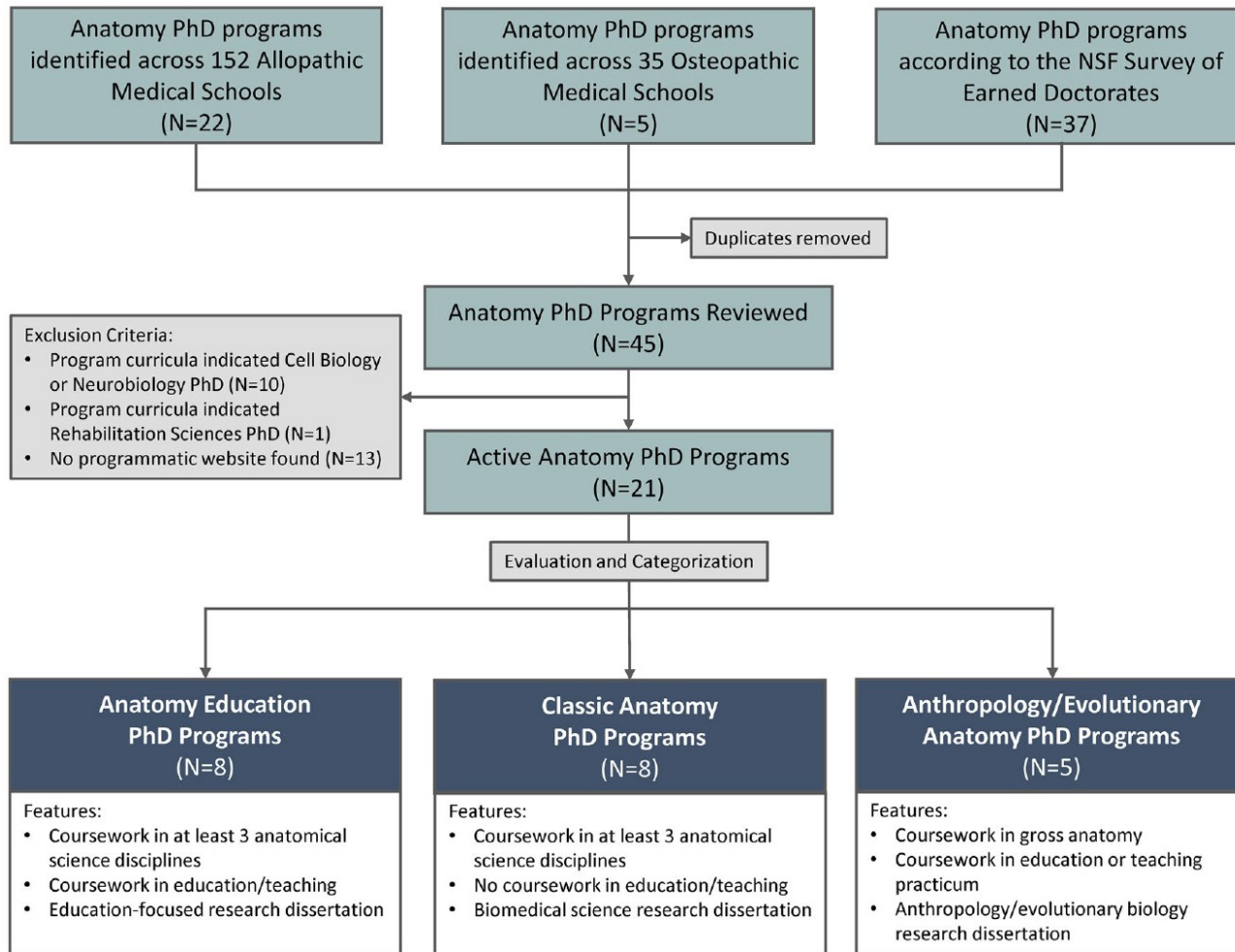
In the absence of a large training grant to support our graduate students, we must rely on internal sources of funding:

- **Tuition Revenue –**

- At the Indianapolis campus, 80% of tuition revenue generated from our medical and graduate courses comes back to the department.
 - This provides incentive to create new courses for other student populations (e.g., PA, PT, OT, DO, etc.).
- At the Bloomington campus, the teaching of large undergraduate service courses in anatomy provides tuition revenue that can be used to partially offset program expenses.
- All Education Track PhD students on both campuses are required to teach to receive their stipends, which helps to subsidize the costs.



Have other schools developed similar programs?



From: Wilson A.B., Kaza N., Singpurwalla D.J., Brooks W.S. Are Anatomy Programs Nearing Extinction or Adapting to Change? United States Graduate Education Trends in the Anatomical Sciences. *Anat Sci Educ* 14: 432-439, 2021.



Anatomy Education PhD Programs in the U.S.

Indiana University School of Medicine

Dept of Anatomy, Cell Biology & Physiology

Education Track PhD

<https://bulletins.iu.edu/iu/gradschool/2021-2022/programs/indianapolis/anatomy-cell-biology-and-physiology/index.shtml>

University of Mississippi Medical Center

Dept of Neurobiology and Anatomical Sciences

Division of Clinical Anatomy

PhD in Clinical Anatomy

<https://www.umc.edu/som/Departments%20and%20Offices/SOM%20Departments/Neurobiology/Education/Clinical-Anatomy/Graduate-Program-in-Clinical-Anatomy/PhD-Plan-of-Study.html>

The Ohio State University College of Medicine

Division of Anatomy

PhD Educational Research Track

<https://medicine.osu.edu/departments/anatomy/education/graduate-degrees>

University of Oklahoma Health Science Center

Dept of Cell Biology through the Instructional Leadership and Academic Curriculum Program

PhD in Biomedical Education (anatomy focus)

<https://basicsciences.ouhsc.edu/cb/Academic-Programs/Doctor-of-Philosophy-in-Biomedical-Education>



Anatomy Education PhD Programs in the U.S.

University of Florida College of Medicine

Dept of Anatomy and Cell Biology

PhD in Anatomical Science Education

<https://acb.med.ufl.edu/education/graduate-program/phd-programs/ase-phd/>

Lincoln Memorial University DeBusk College of Osteopathic Medicine, TN

PhD in Anatomical Education

<https://www.lmunet.edu/debusk-college-of-osteopathic-medicine/phd-in-clinical-anatomy/index.php>

Lake Erie College of Osteopathic Medicine, PA

PhD in Anatomy Education

<https://lecom.edu/gsbs/phd-in-anatomy-education/>

Eastern Virginia Medical School

PhD in Medical and Health Professions Education

(with concentration in Contemporary Human Anatomy Education)

https://www.evms.edu/education/medical_and_health_professions_education/mhpe_doctoral_program/



References

Brokaw J.J., O'Loughlin V.D. Implementation of an Education-Focused PhD Program in Anatomy and Cell Biology at Indiana University: Lessons Learned and Future Challenges. *Anat Sci Educ* 8: 258-265, 2015.

Langley N.R., Butaric L.N. Anatomical Sciences Education Among Biological Anthropology Graduates: A Solution to the Dearth of Anatomy Educators? *Med Sci Educ* 30: 129-137, 2020.

McCuskey R.S., Carmichael S.W., Kirch D.G. The Importance of Anatomy in Health Professions Education and the Shortage of Qualified Educators. *Acad Med* 80: 349-351, 2005.

Schafer A.F., Wilson A.B., Barger J.B., Azim H.M., Brokaw J.J., Brooks W.S. What Does a Modern Anatomist Look Like? Current Trends in the Training of Anatomy Educators. *Anat Sci Educ* 12: 224-235, 2019.

Wilson A.B., Barger J.B., Perez P., Brooks W.S. Is the Supply of Continuing Education in the Anatomical Sciences Keeping Up with the Demand? Results of a National Survey. *Anat Sci Educ* 11: 225-235, 2018.

Wilson A.B., Notebaert A.J., Schaefer A.F., Moxham B.J., Stephens S., Mueller C., Lazarus M.D., Katrikh A.Z., Brooks W.S. A Look at the Anatomy Educator Job Market: Anatomists Remain in Short Supply. *Anat Sci Educ* 13: 91-101, 2020.

Wilson A.B., Kaza N., Singpurwalla D.J., Brooks W.S. Are Anatomy Programs Nearing Extinction or Adapting to Change? United States Graduate Education Trends in the Anatomical Sciences. *Anat Sci Educ* 14: 432-439, 2021.



SCHOOL OF MEDICINE

INDIANA UNIVERSITY

Questions?