

Approvals

Department: 11/17/06

IUSM Graduate Division: 1/2/07

Proposal for Education Track Anatomy PhD
Department of Anatomy and Cell Biology
Indiana University School of Medicine

Rationale for Education Track: The Department of Anatomy and Cell Biology currently offers a 90 credit hour PhD program that prepares students for careers in cutting-edge biomedical research. The Department is proposing a separate PhD track that would prepare students for careers in anatomical teaching and educational research. This new career track is justified by the growing demand at the nation's health professional schools for highly qualified educators in the anatomical sciences. As classically-trained anatomists retire and leave the workforce, they are not being replaced by newly-minted PhDs with the requisite training and career focus needed to maintain the teaching mission. This new track would provide students who desire a career focus in education with extensive training in the anatomical sciences coupled with sufficient teaching experience to be fully prepared to assume major educational responsibilities upon graduation. Equally important, students in this track would be trained to conduct rigorous educational research, culminating in a doctoral dissertation that meets the academic standards of Indiana University.

Goal of Education Track: To produce a cadre of doctoral-level anatomy educators who are capable of teaching all of the anatomical disciplines to undergraduate, graduate, or professional students, and who are capable of producing the high-quality educational research and other scholarly work necessary for promotion and tenure.

Education Track Committee: Dr. David Burr, Chair of Anatomy and Cell Biology, charged eight IU faculty members with designing the Education Track Anatomy PhD curriculum. The Committee had broad representation from anatomists around the state, as well as from the School of Education:

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

Education Track Overview: The Education Track curriculum requires a total of **90** credit hours, **64** credits in required coursework and **26** credits in dissertation research. The coursework is divided into two "core" areas, as well as statistics courses and free electives:

- **Anatomy Core** (31 hours) – will provide rigorous training in the major anatomical disciplines of Gross Anatomy, Histology, Neuroscience, and Cell Biology, as well as supervised and mentored teaching experiences with medical students and graduate students.
- **Education Core** (18 hours) – will provide fundamentals of pedagogy and assessment, including educational research and scholarship.
- **Statistics Courses** (6 hours) – will provide the statistical tools needed to properly design and evaluate educational research projects.
- **Free Electives** (9 hours) – will provide the opportunity for further training in the biomedical sciences, education, or statistics.

Education Track Curriculum: All of the courses in this curriculum, with the exception of *Teaching Practicum*, are pre-existing courses offered on a regular basis. Approval of *Teaching Practicum* as a new graduate course will be sought.

Anatomy Core (31 hours)

- D850 Gross Anatomy (8)
- D851 Histology (4)
- D852 Neuroscience and Clinical Neurology (5)
- X/G804 Cellular and Molecular Biology (3)
- D861 Seminar (1); required yearly, which would sum to 5 credit hours assuming a 5-year degree completion time; this seminar series would focus on educational topics rather than bench research.
- D#### Teaching Practicum (2); supervised teaching in Gross Anatomy, Histology, and Neuroscience (repeated for 6 hours total); this teaching would entail lecturing as well as assisting in laboratory instruction.

Education Core (18 hours)

- M620 Pedagogical Methods in the Health Sciences (3)
 - J500 Instruction in the Context of Curriculum (3)
 - P510 Psychology of Teaching (3)
 - Y520 Strategies for Educational Inquiry (3)
 - And either:
 - Y527 Educational Assessment and Psychological Measurement (3)
- OR**
- Y535 Evaluation Models and Techniques (3)

And **ONE** course selected from:

- A500 Introduction to Educational Leadership (3)
- C655 Higher Education and Public Policy (3)
- C565 Introduction to College and University Administration (3)
- R511 Instructional Technology Foundations I (3)
- R521 Instructional Design and Development I (3)
- Y611 Qualitative Research in Education (3)

Statistics Courses (6 hours)

- G651 Introduction to Biostatistics I (3)
- G652 Introduction to Biostatistics II (3)

Free Electives (9 hours)

- To be selected in consultation with advisor

Comparison of Proposed Education Track with the Current Biomedical Research Track:

Proposed Education Track

90 hours required,
with 64 hours in courses
other than research:

Anatomy courses (20)
Seminar (5)
Teaching (6)
Education courses (18)
Statistics courses (6)
Elective courses (9)
Research (26)

Current Research Track

90 hours required,
with 32 hours in courses
other than research:

Anatomy courses (12-17)
Seminar (5)
Teaching (0)
Minor courses (12)
Statistics course (3)
Elective courses (0)
Research (53-58)

Is there documentation of a need and demand for students in the Education Track?

In recent years, there have been several published reports and symposia devoted to the growing shortage of anatomy instructors:

- 2002 survey of Association of Anatomy, Cell Biology, and Neurobiology Chairpersons (AACBNC) (http://www.anatomy.org/Membership/survey_academic_departments.htm).
- Wanted: More anatomy instructors – institutions explore ways to cope with shortages. *AAMC Reporter* 13:6-7, 2003 (<http://www.aamc.org/newsroom/reporter/march03/anatomy.htm>).
- Anatomy classes face gross shortage. *Science* 299:1309, 2003.
- The importance of anatomy in health professions education and the shortage of qualified educators. *Academic Medicine* 80:349-351, 2005.
- 2005 American Association of Anatomists symposium focused on shortage of qualified anatomy instructors.

According to the AACBNC survey, more than 80% of anatomy-related department chairs anticipate having “great” or “moderate” difficulty finding qualified gross anatomy teachers in the next five years (95 schools reporting). A minority of these schools (37%) require graduate students to take gross anatomy. Of the few students who do take gross anatomy, less than half intend to teach it in during their careers. Given these factors, it is projected that 190 graduate students who intend to teach gross anatomy will finish their training in the next few years. However, the age distribution of the current faculty suggests that approximately 625 classically-trained PhD anatomists will retire in the next decade, resulting in a major deficit of qualified instructors. Further exacerbating this shortfall, the Association of American Medical Colleges is recommending a 30% increase in medical class size by 2015. Several states are even planning new medical schools. Thus, it appears likely that the demand for gross anatomy teachers will far

exceed the available supply. Although the problem is most acute for gross anatomy, similar concerns apply to the anatomy teaching disciplines of embryology, histology, and neuroscience.

Why is the Education Track needed to produce qualified anatomy teachers?

The last two decades have witnessed dramatic changes in the way anatomists are trained as more and more anatomy departments have shifted their priorities to favor intensive laboratory research that is competitive for federal funding. The training of graduate students has followed suite. Paradoxically, a doctorate in anatomy no longer guarantees expert knowledge of anatomy. The impending shortage of qualified anatomy teachers is a direct manifestation of this national shift in training priorities. Under the School's newly instituted Biomedical Gateway Program, graduate students in Anatomy and Cell Biology will not be required to study gross anatomy or any other classic anatomical discipline. By design, all of the coursework will be closely related to cutting-edge biomedical research, since that is the expressed purpose of the program. Students will take a series of modular courses in biochemistry, cell biology, genetics, molecular biology, systems biology, and specialized electives dictated by their individual research interests. The new curriculum does not, however, accommodate major medical school courses like gross anatomy. Indeed, students will be actively discouraged from taking such courses because of the required time commitment away from bench research. From the perspective of the students and their mentors, educational activities that do not directly contribute to research productivity will be viewed as irrelevant distractions. The Biomedical Gateway Program will undoubtedly produce excellent biomedical researchers, but certainly not anatomy teachers. Such a research-intensive environment will simply not attract the kind of student who desires an education career focus. This means that few, if any, of the graduate students in the Biomedical Gateway Program will likely be interested in earning the extra credentials needed to obtain a teaching position. For this reason, curricular add-ons such as Preparing Future Faculty programs or teaching-oriented certificate programs are not realistic alternatives for producing qualified anatomy teachers. To fulfill this responsibility, the Department must adopt a specialized curriculum that will attract and train the next generation of anatomists. The proposed Education Track will produce a small but stable supply of doctoral-level anatomy teachers for a growing academic market.

We wish to emphasize that training qualified anatomy teachers, while important, is not the only rationale for the Education Track. There is a growing recognition that medical education should be evaluated with the same rigor as medical science if we are to produce better MDs (see: *Educational epidemiology: applying population-based design and analytic approaches to study medical education. JAMA 292: 1044-1050, 2004*). Few basic science faculty members are qualified to conduct the necessary research, and the Education Track is unique in that it will prepare students to be qualified educational researchers, as well as anatomy teachers.

How many students will the Department recruit into the Educational Track?

It is anticipated that the Education Track will attract graduate students seeking careers in teaching and educational leadership, rather than laboratory-based research. Students with a Masters degree in Anatomy or Science Education might be especially suitable candidates. The Department plans to accept no more than 2 or 3 students into the program per year. This limitation is set by funding constraints of the Department. The Education Track students will not be supported by individual investigator grants the way other graduate students are supported. If our past experience with graduate students is any guide, we anticipate having no difficulty

recruiting 2 or 3 highly qualified students into the Education Track per year. Some of the graduates from our standard PhD track have opted for teaching jobs rather than research-intensive faculty appointments. We believe that such students would have preferred an Education Track option at the outset of their training.

How will the Education Track prepare students for educational scholarship?

Although demonstrated excellence in anatomical teaching will be required of students in this track, the act of teaching, in of itself, does not constitute scholarship. Like scientific research, educational scholarship is informed by the relevant literature, draws upon the best practices and methodology in the field, is peer-reviewed, and is made public (i.e., published). Accordingly, the students in this track must be sufficiently cross-trained in anatomy AND education so that they can produce the scholarly work that is acceptable to both fields.

- *Specifically, how will the education and statistics courses prepare students for educational scholarship?*
 - The five required courses in the education core will introduce students to four major domains in the field of education: pedagogy (M620), curriculum development (J500), learning theory (P510), and tests and measures (Y520, Y527/Y535). The two “tests and measures” courses will provide basic and advanced training in educational research methodology, which will lay the foundation for dissertation work. Depending on their interests and career goals, students will also select one course from educational administration (A500, C655, C565), educational technology (R511, R521), or qualitative research methodology (Y611).
 - The educational research projects the students will pursue for their dissertations will likely involve population-based data derived from human subjects here or elsewhere (if use secondary datasets). By necessity, such studies are often “uncontrolled” with numerous covariates that might influence the outcome(s) of interest. A firm grounding in statistics is therefore essential. The two required statistics courses (G561, G562) will provide students with sufficient training to properly analyze and interpret their results. Consultation with statisticians (if available) is always appropriate during the planning of research projects, but students still need to be sufficiently versed in statistics to interact effectively with statistical consultants and to understand the published results of others.
- *What other aspects of the program will prepare students for educational scholarship?*
 - In addition to the coursework mentioned above, students will be required to take a seminar course (D861) each year of the program. This series will focus on educational research topics that are unique to the health professions (e.g., the use of standardized patients in assessment) and advanced topics not otherwise covered in the coursework.
 - All students will be required to take and pass a Qualifying Examination (in the third year) for admission to doctoral candidacy. Students will be expected to create and defend an educational research project, perhaps in the format of an NIH-style grant proposal.
 - The dissertation committee that oversees the student’s research will consist of content experts (anatomists), as well as members of the School of Education with relevant expertise in educational research. Other members deemed appropriate

might include faculty members with experience conducting medical education research and a statistician.

- *What constitutes medical education research?*
 - Medical education research uses analytical approaches and methodologies that are familiar to the “hard” sciences, like biomedicine, as well as research techniques that are commonly employed in the disciplines of sociology, anthropology, and psychology. The particular methods used are matched to the kinds of research questions for which they are most appropriate. Rigorous medical education research has many of the same features as biomedical research—the major conceptual difference being the outcome of interest (see: *Feeling better: a comparison of medical research and education research. Educational Researcher* 35: 24-29, 2006.) Whereas biomedical research attempts to elucidate the underlying mechanism of some measurable biologic event (e.g., inflammation), medical education research seeks to understand the causal relationship between certain educational variables and measurable learning outcomes (e.g., improved diagnostic skills). Both kinds of research are grounded in theory, are formulated to test hypotheses, contain dependent and independent variables, attempt to control for spurious results, employ appropriate research designs (e.g., case-control studies, prospective and retrospective cohort studies, randomized controlled studies, etc.) and are validated by inferential statistics. In short, both kinds of research employ “the scientific method”. However, medical education research is not limited to these quantitative approaches alone, but can be supplemented and enriched with qualitative research methods drawn from the traditions of sociology and other “soft” sciences. All students in the Education Track will be expected to pursue a hypothesis-driven educational research project that employs scientifically-sound methodologies in the mainstream of human subjects research. The research project need not be restricted to anatomy teaching, but can delve into any aspect of medical education, including pre-professional education, undergraduate medical education, graduate medical education, or continuing medical education.
- *Can the student’s research project be laboratory-based rather than educational scholarship?*
 - No. The Education Track is designed as a distinct alternative to the standard Research Track. Its intent is to train students as anatomy teachers and educational researchers. These two facets are considered integral to the training, and one without the other would diminish the degree’s unique value. If a student wishes to do a laboratory-based project, he or she would be better off pursuing the Research Track option (Biomedical Gateway Program).
- *Who will serve as advisors to guide the student’s educational scholarship?*
 - Statewide, the Department of Anatomy and Cell Biology has several faculty members who have published educational research, reviewed educational research papers for prominent journals, written anatomy textbooks, or directed graduate students doing educational thesis projects. Given that the number of graduate students in the Education Track will be limited to 2-3 per year, the number of qualified faculty members willing to serve as advisors should more than meet the demand. If there are aspects of the student’s research where the advisor feels

unqualified, he or she can defer to others on the dissertation committee who have the necessary expertise to guide the student.

- *What are the avenues for disseminating educational scholarship?*
 - There are numerous high-quality journals devoted to publishing medical education research, such as *Academic Medicine*, *Medical Education*, *Teaching and Learning in Medicine*, to name just a few. Many specialty journals also publish medical education papers. For example, both *The Anatomical Record, Part B*, and *Clinical Anatomy* publish original articles about anatomical education. A new journal is planned called *Anatomical Sciences Educator*. The Internet-based *MedEdPORTAL* recently established by the Association of American Medical Colleges provides a mechanism for the peer-review and dissemination of educational products other than research studies (e.g., problem-based learning cases, evaluation instruments, etc.).
- *What are the funding mechanisms for educational scholarship?*
 - Unfortunately, there are few funding sources for educational research that are on par with those for biomedical research. Although there are some substantial grants available (e.g., the Stemmler Fund of the National Board of Medical Examiners), the reality is that most medical education research is funded through small foundations, professional societies, and institutional and local sources. These educational grants tend to be modest by biomedical research standards (e.g., \$10 K to \$20 K). It is therefore unrealistic to expect faculty members who conduct educational research to contribute the same level of cost recovery that would be expected of R01 grantees. Of course, the cost of conducting educational research is substantially less than that of biomedical research. This simply means that graduates of the Education Track will have to find positions in the workforce that are not heavily dependent on “soft” money.

Will the Education Track be a unique PhD program?

To the best of our knowledge, the Education Track Anatomy PhD would be the first formally instituted program of its kind in the nation. However, we are aware of at least one other biomedical science PhD program in Indiana that offers its students the option of conducting an educational dissertation project. Purdue University awards a PhD in Basic Medical Sciences based on original scholarship in biomedical education. Graduates of this program are in much demand and easily secure faculty appointments.

Placed in its larger context, the Education Track conforms to the spirit of the *Carnegie Initiative on the Doctorate*, “an action and research project to encourage and support departments’ efforts to improve the quality of their doctoral programs by designing and putting new initiatives into practice” (http://gallery.carnegiefoundation.org/cid/cid/cid_collection.html). Several of the participating departments, including those from basic science disciplines, are developing initiatives that foster effective teaching practices. Interdisciplinary training is also a recurrent theme. We believe the Education Track is an innovative doctoral program that will set the standard for anatomical education.

Advisor: The graduate advisor for the Education Track will be Dr. Mark Seifert, Professor of Anatomy and Cell Biology.

Timetable: The Department of Anatomy and Cell Biology is seeking approval for the Education Track Anatomy PhD as soon as possible.

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3/16/2007

Suggested Course Sequence for the Education Track

| | Fall | Spring | Summer |
|---------------|---|---|----------------------------|
| Year 1 | Gross Anatomy (8) Cellular and Molecular Biology (3) | Histology (4) Introduction to Biostatistics I (3) Pedagogical Methods in the Health Sciences (3) Seminar (1) | Psychology of Teaching (3) |
| Year 2 | Neuroscience and Clinical Neurology (5) Introduction to Biostatistics II (3) Instruction in the Context of Curriculum (3) | Strategies for Educational Inquiry (3) Education Selective (3) Teaching Practicum (2) Seminar (1) | Research |
| Year 3 | Evaluation Models and Techniques (3) Free Elective (3) Teaching Practicum (2) Research | Free Elective (3) Free Elective (3) Teaching Practicum (2) Seminar (1) Research | Research |
| Year 4 | Research | Seminar (1) Research | Research |
| Year 5 | Research/Dissertation | Seminar (1) Research/Dissertation | |

Catalog Descriptions of Required and Selective Courses in the Education Track:

Anatomy Courses

D850 Gross Anatomy (8 cr.) - Intensive introduction to the gross anatomy of the human body, including a complete dissection. Lectures include radiographic anatomy, embryology, and emphasize clinically applied anatomy.

D851 Histology (4 cr.) - A comprehensive survey of the microscopic structure of the cells, tissues, and organs of the human body; correlation of structures and function.

D852 Neuroscience and Clinical Neurology (5 cr.) - A multidisciplinary consideration of structural, functional, and clinical aspects of the human nervous system.

X/G804 Cellular and Molecular Biology (3 cr.) - Cellular and molecular biology that emphasizes the structural organization, biochemistry, and molecular biology of cells. Includes cellular processes, development and differentiation, and their relationship to medicine.

D861 Seminar (1 cr.) - Required yearly by all program participants. Included in the seminar series will be oral presentations and post-seminar discussion of papers by students, staff, and invited guest lecturers.

D#### Teaching Practicum (2 cr.) - **APPROVAL PENDING** - This course is designed to provide each student with supervised teaching experiences in Gross Anatomy, Histology, and Neuroscience, as well as critical reviews of all teaching duties.

Education Courses

M620 Pedagogical Methods in the Health Sciences (3 cr.) - This course is for biomedical sciences graduate students who want to be excellent instructors and classroom researchers. Students will learn about pedagogical methods, student learning styles and methods of instructional delivery. Students also will learn about the scholarship of teaching and develop a foundation for implementing classroom research and assessment. This course is offered through the Medical Sciences Program on the Bloomington campus. It will be offered via distance-learning for students elsewhere in the state.

J500 Instruction in the Context of Curriculum (3 cr.) - First course for the master's degree in curriculum and instruction. Extends concepts introduced in undergraduate teacher preparation. Topics include conceptions and definitions of curriculum and instruction and their impact on social contexts, learning theories, and schooling practices. Elementary and secondary contexts are studied.

P510 Psychology of Teaching (3 cr.) - Basic study of psychological concepts and phenomena in teaching. An analysis of representative problems and of the teacher's assumptions about human behavior and its development. Intended for current and prospective classroom teachers who are working toward a master's degree.

Y520 Strategies for Educational Inquiry (3 cr.) - Introductory course intended to orient beginning graduate students to the conduct of social science inquiry in general and educational inquiry in particular and to acquaint them with key terms and generally accepted procedures in qualitative and quantitative inquiry.

Y527 Educational Assessment and Psychological Measurement (3 cr.) - P: P501, Y520. Theoretical foundations for assessing educational and psychological constructs, with application to tests and alternative assessment procedures; methods for estimating reliability and validity; and techniques for scale construction, including attitude, personality, interest, aptitude, and performance.

Y535 Evaluation Models and Techniques (3 cr.) - P: Y520 or equivalent. An overview of evaluation as an inquiry process, including a discussion of the history of evaluation and the state of the art. Frameworks and models for planning evaluation studies are discussed and applications are demonstrated. Criteria for evaluating studies, steps for

writing evaluation proposals and reports, and techniques for the collection of information are discussed. This course is similar to J660. Credit may not be earned in both courses.

A500 Introduction to Educational Leadership (3 cr.) - This course entails an introduction to the history, philosophy, and social aspects of educational leadership. It reviews relevant theories of administration; the historical role of administration in schools; and the political, social, economic, and philosophical frameworks that have informed administration.

C655 Higher Education and Public Policy (3 cr.) - Course will introduce a broad range of public policy themes associated with higher education. Topics to be considered include roles of federal, state, and local governments; legislation, regulation, and policy formulation; impact of special commission reports, landmark legislation, and lobbying; and other external relations.

C565 Introduction to College and University Administration (3 cr.) - Types of institutions and their organization and roles on the nationwide scene; their principal administrative functions, including faculty personnel, business management, public relations; relationship of student personnel to other administrative positions.

R511 Instructional Technology Foundations I (3 cr.) - Introduction to the field, theory, and profession of instructional technology, including definitions of instructional technology, the history of the field, and current trends and issues. Includes participation in a colloquium, a series of presentations, and discussions devoted to broadening understanding of the instructional technology field and career opportunities.

R521 Instructional Design and Development I (3 cr.) - Introduces the instructional systems development process, from analysis through evaluation and implementation, and includes practice in all phases. Emphasizes design issues such as classification of learning tasks, selection of instructional strategies, and development of prototypes. Students practice the design of effective and appealing instruction based on principles from instructional theory.

Y611 Qualitative Research in Education (3 cr.) - P: Y520 or H510 or consent of instructor. Examination of qualitative approaches to educational inquiry (e.g., case study, naturalistic inquiry, educational anthropology, educational connoisseurship, and criticism). Exploration of methods for collecting and analyzing qualitative data, criteria for field studies, and approaches to writing up field studies.

Statistics Courses

G651 Introduction to Biostatistics I (3 cr.) - The course is an introduction to biostatistics. Students learn to apply statistical techniques to the processing and interpretation of data from health studies. Topics covered include probability, descriptive statistics, study design, and linear regression, among others.

G652 Introduction to Biostatistics II (3 cr.) - The course follows G651 and provides more in-depth coverage of multiple regression and ANOVA, and introduces more advanced statistical topics such as logistic regression and survival analysis.