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January 22, 2016

Vice Provost W. Randy Smith
Council on Academic Affairs
Office of Academic Affairs
203 Bricker Hall
190 North Oval Mall
Columbus, OH 43210

Dear Council on Academic Affairs Members,

I am pleased to submit for your review a proposal to create an undergraduate minor in Pharmaceutical Sciences. We see this program as an opportunity to provide unique training to a much broader student audience, which in turn would offer a competitive edge to our graduates pursuing careers in healthcare and the pharmaceutical industry. We are seeking approval of the new minor with a goal of implementation in AU2016.

This proposal is the culmination of an intense year-long evaluation and revision of our undergraduate pharmaceutical sciences teaching, and we are extremely excited about the program's potential. Please don't hesitate to contact me if you have any questions or concerns during this approval process.

Sincerely,

Nicole Cartwright Kwiek, Ph.D.
Director of Undergraduate Studies
Clinical Assistant Professor of Pharmacology

CC: Dean Henry Mann, Assoc. Dean Katherine Kelley, Assoc. Dean Jim McAuley

Proposal for an Undergraduate Minor in Pharmaceutical Sciences

The Ohio State University College of Pharmacy

Executive Summary

We propose to establish an undergraduate minor in Pharmaceutical Sciences to be implemented in Autumn 2016. This minor will further solidify the Ohio State College of Pharmacy's distinctive national role in undergraduate education in the Pharmaceutical Sciences. The addition of the minor will also allow the College of Pharmacy to expand its offerings to a broader population of students in a way that benefits the students, university, local industry, and the State of Ohio. The academic unit responsible for administering the minor program will be the College of Pharmacy.

Background and Rationale

The impact of drugs in our 'pharmaceuticalized' society is widespread and undeniable. Clinicians more often than not turn to drugs as a first-line treatment, and medicines undoubtedly help us to lead longer, healthier lives. Further, the pharmaceutical industry, a major player in national and international economics, continues to advance drug discovery and development. Opportunities abound in the drug sector, and our students stand to gain a competitive edge by knowing more about this field.

The Bachelor of Science in Pharmaceutical Sciences (BSPS) program was rolled out to students in Autumn 1999 with the intent of preparing graduates for positions within the pharmaceutical industry, regulatory government agencies, or advanced study in graduate professional programs. Initial projections for the major program totaled 40-80 students; the current BSPS student population stands closer to 500. Though BSPS major enrollment has much exceeded expectations, there exists no mechanism by which to engage non-majors in the content. Seeing opportunity in this interest, the College of Pharmacy initiated a year-long curricular revision project in 2014, which included the design of the undergraduate Minor in Pharmaceutical Sciences proposed here.

The Pharmaceutical Sciences minor program is intended to be a flexible way for our students to gain exposure to topics related to drug action and delivery. Constructed in a way that benefits both science and non-science majors, the minor will allow students of diverse backgrounds to deepen their drug knowledge as health consumers as well as help to give them an edge in their career pursuits in health care, business, research, public health, etc. We anticipate demand from a wide array of audiences, including but not limited to STEM/pre-health students planning to pursue graduate/professional school, business students who want to eventually work in the pharmaceutical industry; and, public health students preparing to work in health policy. Importantly, a minor program offers OSU students the opportunity to engage in a relatively rare field of study. There are less than 20 undergraduate Pharmaceutical Sciences programs in the nation, and our premier program is by far the largest. The proposed minor will provide an opportunity to expand the population who gains from this unique content. Broadly speaking, students will benefit from the minor as it allows them to develop a better understanding of the health care system and safe medication use. More specific to their professional interests, this minor will open up opportunities for students to pursue other careers in the health care industry. A minor in Pharmaceutical Sciences will make our students more attractive to both established and start-up pharmaceutical companies who seek employees with a background in the drug discovery and delivery process. The additional benefit to the region comes in the form of a greater pool of candidates with this experience for those growing local pharmaceutical companies with increasing hiring needs.

Minor in Pharmaceutical Sciences: Proposed Requirements

The minimum number of credits for completion of the pharmaceutical sciences minor is 12 hours. The minor has one required course, PHR 2500 Drug Discovery, Development, and Delivery. Additionally, students must choose one course from a list of “Contemporary Issues” courses. The remaining curricular component of the minor will comprise electives which students may freely select in order to tailor their studies to their individual interests and career goals. Existing College of Pharmacy and University resources are sufficient for the minor. Course descriptions and the minor sheet are included in Appendices A and B, respectively.

Required course:

PHR 2500 Drug Discovery, Development, and Delivery (3 hrs)

This course provides a comprehensive overview of drug discovery, development, and delivery process within the U.S. healthcare system, exploring the roles of vested stakeholders (e.g., patients, pharmaceutical industry, providers, insurers, society, etc.) during a drug’s “bench to bedside” development.

Contemporary Issues course (students choose at least one):

PHR 2010 Fundamentals of Pharmacology (3 hrs)

This course presents an overview of basic principles underlying drug action.

PHR 2400 Addicting Drugs (2 hrs)

Students will develop a basic knowledge of the effects, mechanisms of action, and regulation of addicting drugs and a beginning understanding of neurobiology.

PHR 2510/H: Introduction to Pharmacy (2 hrs)

A survey of the profession of pharmacy, dealing with its history, educational requirements, organization, regulation, and current developments.

PHR 3400 Therapeutic Frontiers (2 hrs)

Overview of promising new strategies and technologies in disease treatment.

PHR 3500 Ethics and Professionalism in the Pharmaceutical Sciences (2 hrs)

The course will develop core competencies in dealing with ethical issues in health care settings amidst a biologically, socially, and culturally diverse patient population. This will include a discussion of the ethical responsibilities and professional conduct of the pharmaceutical industry, including clinical drug trials and studies, research, and marketing and promotion. The course will also provide a discussion of basic principles of business ethics and proper ethic conduct in other health care industries.

PHR 3510: Principles of Therapeutics (1.5 hrs)

Designed to provide knowledge about medication therapies and treatment guidelines for common illnesses affecting patients.

PHR4000, 4010 Integrated Pharmaceutical Sciences I and II (5 hrs each)

Principles governing the design, synthesis, delivery, action and use of drugs in disease treatment. Model disease pathophysiology and treatment will be investigated, discussing how biological differences can be targeted for therapeutic gain.

PHR 4440: Pharmacology of Neurologic and Psychiatric Disorders (3 hrs)

This course is designed for pharmaceutical sciences majors, neuroscience majors or nonmajors with a basic knowledge of biology. This course will serve as an introduction to principles of pharmacological therapy of neurologic and psychiatric diseases.

PHR 4460: Current Addiction Neurobiology Literature (1 hr)

Current research findings related to neurobiology of addiction are explained and interpreted.

Minor Electives (to bring total to 12 hours):

Students can enroll in most PHR courses, as long as the prerequisites are fulfilled.

The minor will be described as follows in the college bulletin:

The Pharmaceutical Sciences minor offers unique training for students pursuing careers in health care and the pharmaceutical industry. Flexible in design, this minor permits students from both science and non-science disciplines to learn about drug science in a variety of contexts.

Comparative Data

If approved, Ohio State University would join only a relatively few institutions worldwide that offer this unique training opportunity.

Implementation and Corollary Issues

The College of Pharmacy already offers a variety of courses which would power the proposed minor program. Nearly all of these courses are not operating at capacity, so the addition of a minor would not require additional educational or support resources. As long as students meet the prerequisites, they would be permitted to enroll in these classes. This design facilitates students being able to tailor the minor more specifically, and efficiently, to their previous training and interests; for example, a Biochemistry student may want to expand upon their heavy science background by enrolling in mostly science-based minor electives while a Business student may want to take more industry-focused courses.

This minor shares slight similarity in content with the College of Social Work's Minor in Substance Misuse and Addiction program. Though both deal with drug topics, they have very different foci; the former investigates issues surrounding drug addiction while our program would mainly look at therapeutic uses of drugs (and the science behind medicinal drug action). A letter of concurrence from Ms. Jennie Babcock, coordinator for that program, is provided in Appendix B.

The anticipated initial number of students in the program is between 25 and 50 per year. Students wishing to minor in Pharmaceutical Sciences will likely come from a wide variety of disciplines including

business, psychology, biomedical sciences, nursing, biomedical engineering, and health sciences. We anticipate that the majority of students attracted to the minor will be science or healthcare majors looking to augment their studies with greater knowledge of the role of drugs within their disciplines. The minor may also be attractive to those seeking to increase their employment prospects within the healthcare industry in broader areas such as marketing, technical writing, and general business. We anticipate the impact of this program to be overwhelmingly positive for faculty, staff, and students outside the College of Pharmacy as it offers additional opportunities for students to connect ideas across disciplines of study.

Approval Steps

This proposal was developed by a curricular revision task force comprised of faculty, staff, students, and industry partners. The College of Pharmacy faculty unanimously approved the proposal in 2014-15. Our College administration is strongly in favor of the proposal, and a letter of support from Dean Mann is included in Appendix B.

APPENDIX A

Information about the proposed minor in Pharmaceutical Sciences

1. Minor course catalog.....pg. 6-9
2. Minor sheet.....pg. 10

Course Catalog for the Minor in Pharmaceutical Sciences

Course Name	Description	Prerequisites	Contemporary Issues course?
Pharmacy 2010: <i>Fundamentals of Pharmacology</i> (3 hrs)	This course presents an overview of basic principles underlying drug action.	None	Yes
Pharmacy 2100: <i>Career Development in the Pharmaceutical Sciences I</i> (0.5 hr)	Overviews clinical- and research-based biomedical careers. Introduces roles and responsibilities, educational preparation, emerging trends, and opportunities in diverse career tracks (including Clinical Professions, Pharmaceutical Industry, Academia, Regulatory Affairs).	None	No
Pharmacy 2400: <i>Addicting Drugs: Effects, Introductory Neurobiology, and Regulation</i> (2 hrs)	Overview of effects, regulation, and mechanism of action of addicting drugs, with an introduction to function of the nervous system and how this function is altered by drugs.	None	Yes
Pharmacy 2500: <i>Drug Discovery, Development and Delivery</i> (3 hrs)	This course provides a comprehensive overview of the drug discovery, development, and delivery process within the U.S. healthcare system, exploring the roles of vested stakeholders (e.g., patients, pharmaceutical industry, providers, insurers, society, etc.) during a drug's "bench to bedside" development. Additionally discusses post-approval issues with respect to access, social impact, and safety.	None	No
Pharmacy 2510/H: <i>Introduction to Pharmacy</i> (2 hrs)	A survey of the profession of pharmacy, dealing with its history, educational requirements, organization, regulation, and current developments.	None	Yes
Pharmacy 3400: <i>Therapeutics Frontiers</i> (2 hrs)	Overview of promising new strategies and technologies in disease treatment.	None	Yes
Pharmacy 3500: <i>Ethics and Professionalism in the Pharmaceutical Sciences</i> (2 hrs)	The course will develop core competencies in dealing with ethical issues in health care settings amidst a biologically, socially, and culturally diverse patient population. This will include a discussion of the ethical responsibilities and professional conduct of the pharmaceutical industry, including clinical drug trials and studies, research, and marketing and promotion. The course will also provide a discussion of basic principles of business ethics and proper ethic conduct in other health care industries.	Pharmacy 2500	Yes
Pharmacy 3510: <i>Principles of Therapeutics</i> (1.5 hrs)	Designed to provide knowledge about medication therapies and treatment guidelines for common illnesses affecting patients.	Pharmacy 4000 prerequisite or concurrent	Yes
Pharmacy 4000: <i>Integrated Pharmaceutical Sciences I</i> (5 hrs)	First course in a two-course series. Principles governing the design, synthesis, delivery, action and use of drugs in disease treatment. Model disease pathophysiology and treatment will be investigated, discussing how biological differences can be targeted for therapeutic gain.	Pharmacy 3200 (or permission of instructor), EEOB 2520, or concurrent enrollment in EEOB 2520	Yes
Pharmacy 4010: <i>Integrated Pharmaceutical Sciences II</i> (5 hrs)	Second course in a two-course series. Principles governing the design, synthesis, delivery, action and use of drugs in disease treatment. Model disease pathophysiology and treatment will be investigated, discussing how biological differences can be targeted for therapeutic gain.	Pharmacy 4000 and EEOB 2520	Yes

Pharmacy 4193: Independent Study (var. hrs)	Laboratory and library work designed to give the qualified student an opportunity to complete an original investigation or pursue an interest in a special problem.	CPHR 2.5 or above, and Soph standing, and enrollment in the BSPS program, and permission of instructor	No
Pharmacy 4210: Problem Solving in Biomedical Chemistry (1 hr)	A course designed to use problem-based learning to promote understanding of biomedical concepts. Case studies will be assigned, allowing students to apply biochemical principles and communicate with their colleagues in the course.	Pharmacy 3200, enrollment in the BSPS program, or permission of instructor	No
Pharmacy 4330: Basic Pharmacokinetics (2 hrs)	An elementary course designed to introduce the student to the topic of pharmacokinetics. The application of biopharmaceutics and pharmacokinetic principles as they relate to drug absorption, distribution and elimination will be discussed.	Math 1151, or permission of instructor	No
Pharmacy 4420: Molecular Pharmacology - From DNA to Biopharmaceutical Products (2 hrs)	Introduces students to pharmacological research and drug discovery through readings, discussions, and presentations.	Pharmacy 4000, enrollment in the BSPS program, or permission of instructor.	Yes
Pharmacy 4430: Concepts in Pharmacology II (1 hr)	Focuses on the pharmacology of G-protein-coupled receptors (GPCRs). GPCRs constitute a large and diverse family of proteins whose importance is underscored by the fact that at least one third of the currently marketed drugs target these proteins.	None	No
Pharmacy 4440: Pharmacology of Neurologic and Psychiatric Disorders (3 hrs)	This course is designed for pharmaceutical sciences majors, neuroscience majors or non-majors with a basic knowledge of biology. This course will serve as an introduction to principles of pharmacological therapy of neurologic and psychiatric diseases.	Neuroscience 3000 or Pharmacy 3200 or equivalent or permission of instructor.	Yes
Pharmacy 4460: Current Addiction Neurobiology Literature (1 hr)	Current research findings related to neurobiology of addiction are explained and interpreted.	Students should have some introductory knowledge of neurobiology. Permission of instructor is required.	Yes
Pharmacy 4600: Pharmaceutical Sciences Laboratory (2 hrs)	Laboratory experience in isolation, synthesis, and evaluation of pharmaceutically relevant compounds.	Chemistry 2520, Pharmacy 3200 or concurrent enrollment in Pharmacy 3200. Enrollment in BSPS program or with permission of instructor.	No
Pharmacy 4610: Instrumental Analysis and Experimental Techniques (3 hrs)	Examination of the laboratory instrumentation and methods used in the drug discovery process.	Pharmacy 3200 (or permission of instructor)	No

Pharmacy 4998: <i>General Undergraduate Research</i> (1-18 hrs)	Course credit earned by conducting research while enrolled as an undergraduate student.	Repeatable to a maximum of 60 credit hours or 12 completions	No
Pharmacy 4999: <i>Undergraduate Research Thesis</i> (1-18 hrs)	Culmination of undergraduate research in the form of written thesis.	Repeatable to a maximum of 60 credit hours or 12 completions	No
Pharmacy 5500: <i>History of Pharmacy</i> (3 hrs)	Evolution and development of the profession of pharmacy from antiquity to the present, with emphasis on its Anglo-American development since the 18th century.	Soph. standing in BSPS, enrollment in PharmD program, or permission of instructor	No
Pharmacy 5510: <i>Basics of Pharmaconutrition</i> (3 hrs)	Covers basic information on the effects of dietary factors on pharmaconutrition to be utilized as a foundation in solving patient-related cases in pharmacy practice.	Sr. standing in the BSPS program, enrollment in the PharmD program, or permission of instructor	No
Pharmacy 5520: <i>Advanced Pharmaconutrition</i> (2 hrs)	Provides concepts needed by pharmacists necessary to include nutrition into their daily assessment of patients and integrate their findings into the therapeutic plan.	Pharmacy 5510 and enrollment in the PharmD program, or permission of instructor	No
Pharmacy 5530: <i>The Medical Applications of Radionuclides and Radiopharmaceuticals</i> (2 hrs)	A study of the theoretical and clinical aspects of the preparation, use, control, and handling of radionuclides and radiopharmaceuticals used in medicine.	Jr. standing, and enrollment in Pharmaceutical Science Plan, Allied Medical Profession Plan, or PharmD Plan; or permission of instructor	No
Pharmacy 5540: <i>Introduction to Clinical and Translational Pharmacy Research</i> (2 hrs)	Introduction to conducting research in clinical pharmacy including research design issues and to ethical considerations. Faculty conducting research in various populations will discuss their research, followed by class discussion.	Pharmacy 4000, enrollment in the PharmD or BSPS program, or permission of the instructor	No
Pharmacy 5550: <i>Topics in International Pharmacy</i> (2 hrs)	Seminar on global pharmaceutical issues and international practices of pharmacy.	None	No
Pharmacy 5560: <i>Success & Leadership in Pharmacy</i> (1.5 hrs)	Explore the meaning of success and leadership, attributes of successful leaders and what can be done to be a successful leader.	Enrollment in the College of Pharmacy, or permission of instructor	No

Pharmacy 5570: Seminar on Pharmacy Careers (1 hr)	Discussion and analysis of career pathways in clinical pharmacy and preparation of a career plan paper.	Soph. standing in the BSPS program, enrollment in PharmD program, or permission of instructor	No
Pharmacy 5580: Professional Ethics (1.5 hrs)	The conceptual basis and content of pharmaceutical ethics; significance of codified ethics, interprofessionally considered; individual and group analysis of ethical issues; methods of encouraging compliance.	Soph. standing in the BSPS program, enrollment in PharmD program, or permission of instructor	No

The Ohio State University
College of Pharmacy

Pharmaceutical Sciences Minor

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About the Minor

The Pharmaceutical Sciences minor offers unique training for students pursuing careers in health care and the pharmaceutical industry. Flexible in design, this minor permits students from both science and non-science disciplines to learn about drug science in a variety of contexts.

Minor Requirements

The minor in Pharmaceutical Sciences requires a minimum of 12 credit hours. All students must take PHR2500. Students must fulfill the remaining 9 hours from a list of Pharmacy courses, including at least one designated contemporary issues course. Students should meet with the College of Pharmacy's undergraduate advisors to customize a program.

Required: 3 hours

PHR2500 Drug Discovery, Development, and Delivery

Electives: at least 9 hours

Students must take courses from the following list to bring total hours to 12, including at least 1 contemporary issues course (designated by *). Note: some of these courses have prerequisites that would need to be fulfilled prior to enrollment.

PHR2010* Pharmacology: How Drugs Work (3 cr hrs)
PHR2100 Career Develop in the Pharm Sciences I (0.5 cr hrs)
PHR2367 Drug Use in American Culture (3 cr hrs)
PHR2400* Addicting Drugs (2 cr hrs)
PHR2510* Introduction to Pharmacy (2 cr hrs)
PHR3400* Therapeutic Frontiers (2 cr hrs)
PHR3500* Ethics and Prof. in the Pharm. Sciences (2 cr hrs)
PHR3510* Principles of Therapeutics (1.5 cr hrs)
PHR4000* Integrated Pharmaceutical Sciences I (5 cr hrs)
PHR4010* Integrated Pharmaceutical Sciences II (5 cr hrs)
PHR4193 Individual Studies in Pharm Sciences (Var)
PHR4210 Prob Solving in Biomed Chemistry (2 cr hrs)
PHR4330 Basic Pharmacokinetics (2 cr hrs)
PHR4420* Molecular Pharmacology (2 cr hr)
PHR4430 Concepts in Pharm.: GPCRs (1 cr hr)
PHR4440* Pharm. of Neur. and Psych. Disorders (3 cr hrs)
PHR4460* Contemporary Drug Addiction Literature (1 cr hr)
PHR4470* Contemporary Pharmacology (1 cr hr)
PHR4600 Pharmaceutical Sciences Laboratory (2 cr hrs)
PHR4610 Instrumental Analysis and Techniques (3 cr hrs)
PHR4998 General Undergraduate Research (Var)
PHR5500 History of Pharmacy (3 cr hrs)
PHR5510* Basics of Pharmaconutrition (3 cr hrs)
PHR5520* Advanced Pharmaconutrition (2 cr hrs)
PHR5530* Med. App. of Radionuclides and Radiopharm. (2 cr hrs)
PHR5540* Intro to Clin. and Transl. Pharmacy Research (2 cr hrs)
PHR5560 Success and Leadership in Pharmacy (1.5 cr hrs)
PHR5570 Seminar on Pharmacy Careers (1 cr hr)
PHR5580 Professional Ethics (1.5 cr hrs)

Pharmaceutical Sciences minor program guidelines

Required for graduation: No

Credit hours required: A minimum of 12 cr hrs. 1000-level courses shall not be counted in the minor. At least 6 credit hours must be at the 3000 level or above.

Transfer and EM credit hours allowed: A student is permitted to count up to 6 total hours of transfer credit and/or credit by examination.

Overlap with the GE: A student is permitted to overlap up to 6 credit hours between the GE and the minor.

Overlap with the major and additional minor(s):

- The minor must be in a different subject than the major.
- The minor must contain a minimum of 12 hours distinct from the major and/or additional minor(s).

Grades required:

- Minimum C- for a course to be listed on the minor
- Minimum 2.00 cumulative point-hour ration required for the minor
- Course work graded Pass/Non-Pass cannot count on the minor
- No more than 3 credit hours of course work graded Satisfactory/Unsatisfactory may count toward the minor

X193 credits: No more than 3 credit hours

Minor approval: The minor must be approved by the academic unit. Please see the College of Pharmacy's undergraduate advisors for approval.

Filing the minor program form: The minor program must be filed at least by the time the graduation application is submitted to a college/school counselor.

Changing the minor: Once the minor program is filed in the college office, any changes must be approved by the College of Pharmacy. Please see an undergraduate advisor for approval.

Approved CAA 2-3-16

APPENDIX B

Supporting letters

1. Letter of concurrence from Ms. Jennie Babcock, College of Social Work.....pg. 13
2. Letter of support from Dean Henry Mann, College of Pharmacy.....pg. 14



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Nicole Cartwright Kwiek, Ph.D.
Clinical Assistant Professor
Director of Undergraduate Studies
The Ohio State University College of Pharmacy

Re: Letter of concurrence

Dear Dr. Kwiek,

The College of Social Work has reviewed the Pharmaceutical Sciences minor proposal and does not see any significant overlap with the Substance Misuse and Addiction minor. We are thus pleased to support your minor proposal.

Best regards,

Jennie R. Babcock, MSW, LISW-S
Undergraduate Studies Director
College of Social Work



January 25, 2016

Council on Academic Affairs
c/o Office of Academic Affairs
203 Bricker Hall
190 North Oval Mall
Columbus, OH 43210

Dear Council on Academic Affairs Members,

I am pleased to submit for your review a proposal for an undergraduate minor in pharmaceutical sciences. As part of our on-going revision of the undergraduate curriculum, this minor expands opportunities for students at Ohio State in a way that both supports their current studies and makes them more competitive for professional and graduate school placement.

The College of Pharmacy at The Ohio State University is one of a very few schools who offer an undergraduate curriculum in the pharmaceutical sciences. The growth of this program, and the success of placement for our graduates demonstrate the quality of the BSPS program. This minor enhances an already successful undergraduate program of study in the College of Pharmacy. We believe students at Ohio State who minor in the pharmaceutical sciences will better define themselves in a competitive marketplace. We also believe we have the resources and the capability to offer a minor that is attractive and augments a significant number of major programs at the university. We appreciate your consideration of the proposal, which I very strongly endorse.

Sincerely,

Henry J. Mann, Pharm.D., FCCP, FCCM, FASHP
Dean and Professor
College of Pharmacy