DeBakey Undergraduate Research Program

Program Information

Course: VTPP 285/291/485/491

Term: Spring 2015

Credit Hours: 3

Meeting Times: varied (http://vetmed.tamu.edu/debakeystudents)

Program Description

The Michael E. DeBakey Undergraduate Research Program arose out of competing needs to produce fundable research and to train the next generation of academic researchers. Based on the Research-Intensive Community model (Adv Physiol Educ 32: 136-41, 2008), research is performed in interdisciplinary teams led by a team leader and mentored by a faculty member. Current projects have been chosen both for their importance to basic and applied cardiovascular science and the likelihood to lead to results suitable for publication in peer-reviewed journals. More information about available projects and how to apply at http://vetmed.tamu.edu/debakeystudents

Prerequisites: None.

Learning Outcomes

This program is designed to provide a high-impact learning experience to improve student learning by developing the habits and skills for integrative and lifelong learning:

• Master the depth of knowledge, including the ability to articulate disciplinary and interdisciplinary theories, concepts, principles, skills in the biomedical sciences.

• Demonstrate critical thinking, including the ability to evaluate, analyze, and integrate information from a variety of sources from the biomedical literature; use appropriate strategies and tools to represent, analyze, and integrate physiological information; and develop critical, reasoned positions.

• Communicate effectively, including the ability to demonstrate effective writing and nonverbal communication skills (tables and graphs); and effectively communicate original and creative ideas to biomedical research community.

• Practice personal and social responsibility, including the ability to recognize ethical dilemmas in research and apply rational decision-making in order to address it; choose ethical courses of action in research and practice.

• Prepare to engage in lifelong learning, including the ability to exhibit the skills necessary to acquire, organize, reorganize, and interpret new knowledge; formulate a plan of personal goals for continued professional growth; and demonstrate intellectual curiosity.

Learning Philosophy

This program is designed so that you learn in the process of performing authentic, original research. To achieve the program learning outcomes, all activities are informed by authentic scientific practices. Practicing biomedical researchers 1) guide their own learning, 2) actively build multidisciplinary teams, 3) develop projects in identifiable stages, 4) create new knowledge, and 5) formally communicate results. By guiding you through the process that we use to create publishable research products, you will not only learn the skills and habits of thought to be a successful biomedical researcher, you will have the opportunity to be inducted into this community of practice as a practicing scientist.
Structure of the Program

The structure of the program is designed to produce biomedical research and biomedical researchers:

**Flipped class:** We will use a “flipped class” model in which short video lectures and written materials are studied outside of the classroom and collaborative projects are completed in the lab.
- Learn basic material at your own pace
- Maximize meaningful contact with experts and peers in class working on collaborative projects

**Team-based projects:** All projects will be performed by teams of students with diverse talents, skills and backgrounds.
- Complete each project in a team with diverse abilities to produce research faster
- Identify, leverage and develop your particular research talents and develop team competencies

**Scaffolding the discovery process in phases:** The program is divided into distinct phases used by practicing scientists to scaffold the discovery process and maximize productivity.
- Introduce you to the minimum required knowledge to begin research
- Transition from consumption of standard knowledge to production of new knowledge

**Learning by doing:** We will minimize teaching you facts, concepts procedures with lectures or laboratory exercises with known outcomes. Instead, you will learn in the process of performing authentic research.
- Direct your own learning and teach each others
- Minimize the simple transfer of knowledge

**Scientific Communication:** All program products will be in standard forms used by biomedical scientists to communicate their results to other professionals.
- Learn to communicate in professional environments
- Products have the potential to be submitted to conferences and peer-reviewed journals

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**Instructor Information**

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<tr>
<th>Instructor Name</th>
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<tr>
<td>Christopher Quick, Ph.D.</td>
<td>979-845-2645</td>
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<td>Randolph Stewart, DVM, Ph.D.</td>
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**Textbook and/or Resource Material**

None required

**Grading Policies**

*Developing research products, team competencies, and peer review.* There are four separate projects. Each will include a team research product, and individual competency product, and a peer review:
- Project I: Team Product (20 points), Individual Product (5 points), Peer review (5 points)
- Project II: Team Product (20 points), Individual Product (5 points), Peer review (5 points)
- Project III: Team Product (20 points), Individual Product (5 points), Peer review (5 points)
- Project IV: Team Product (25 points), Individual Product (5 points)

**Team Products**
Working in an interdisciplinary team to produce research and communicate the results is half the challenge of research. You are therefore expected to fully participate in developing team products. When team products are submitted, the team product will be graded by the Faculty Advisors. Your individual grade for team products, however, will be adjusted by your contribution. After Team products are submitted online, you will be prompted to assign a confidential percent effort for yourself and for each of the collaborators (whether or not they are formally on your team), as well as a justification for the percent effort you assigned them. You will also have to justify your contribution, citing what you had to learn to contribute, and specifically what your contribution was. Your personal justification (without your proposed team effort) will be made public to the entire DeBakey Program.
Individual Products
Developing team competencies and developing collaborations maximize efficiency and the scope of scientific problems that can be addressed. The individual product will be graded as satisfactory/unsatisfactory, for which you will be given 0 or 5 points.

Peer Review
Critically evaluating research plans and products, providing constructive criticism, allows you not only to take advantages of opportunities to collaborate, they are essential to become a full member of the research community. You will either provide an insightful suggestion, an incisive argument, or a critical question for at least 3 team products and 3 team products (not in your team). The peer review will be graded as satisfactory/unsatisfactory, for which you will be given 0 or 5 points.

Grading scale:
- >89 points A
- 80-89 points B
- 70-79 points C
- 60-69 points D
- <60 points F

Class Attendance
The University views class attendance as the responsibility of an individual student. Attendance is essential to complete the course successfully. University rules related to excused and unexcused absences are located online at http://student-rules.tamu.edu/rule07.

Late work will not be accepted without a University-approved excuse

Make-up Policy:
If an absence is excused, the instructor will either provide the student an opportunity to make up any quiz, exam or other work that contributes to the final grade or provide a satisfactory alternative by a date agreed upon by the student and instructor. If the instructor has a regularly scheduled make up exam, students are expected to attend unless they have a university approved excuse. The make-up work must be completed in a timeframe not to exceed 30 calendar days from the last day of the initial absence. The reasons absences are considered excused by the university are listed below. See Student Rule 7 for details (http://studentrules.tamu.edu/rule07). The fact that these are university-excused absences does not relieve the student of responsibility for prior notification and documentation. Failure to notify and/or document properly may result in an unexcused absence. Falsification of documentation is a violation of the Honor Code.

1) Participation in an activity that is required for a class and appears on the university authorized activity list at https://studentactivities.tamu.edu/app/sponsauth/index
2) Death or major illness in a student's immediate family.
3) Illness of a dependent family member.
4) Participation in legal proceedings or administrative procedures that require a student's presence.
5) Religious holy day. NOTE: Prior notification is NOT required.
6) Injury or illness that is too severe or contagious for the student to attend class.
   a) Injury or illness of three or more class days: Student will provide a medical confirmation note from his or her medical provider within one week of the last date of the absence (see Student Rules 7.1.6.1)
   b) Injury or illness of less than three class days: Student will provide one or both of these (at instructor’s discretion), within one week of the last date of the absence:
      (i.) Texas A&M University Explanatory Statement for Absence from Class form available at http://attendance.tamu.edu or (ii.) Confirmation of visit to a health care professional affirming date and time of visit.
7) Required participation in military duties.
8) Mandatory admission interviews for professional or graduate school that cannot be rescheduled.
Other absences may be excused at the discretion of the instructor with prior notification and proper
documentation. In cases where prior notification is not feasible (e.g., accident or emergency) the student
must provide notification by the end of the second working day after the absence, including an
explanation of why notice could not be sent prior to the class.

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<th>Topics, Calendar of Activities, Major Assignment Dates</th>
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**Other Pertinent Information**

**Team Projects**

Team products are developed to identify a gap in the current knowledge and generate new knowledge. Individual products are developed to identify gaps in team knowledge and generate new team competencies. The four team projects together will develop research suitable for submission to a peer-reviewed journal.

**FIRST TEAM PROJECT (Phase 1): IDENTIFY GAPS IN KNOWLEDGE**

Perform a literature search to identify the key concepts needed to understand your project, and identify the gaps in scientific knowledge that you can address with the equipment you have been working with (or equipment borrowed from potential collaborating labs).

**Team Product:** Annotated bibliography, and 1 paragraph matching gaps in science knowledge with potential arising from available equipment and supplies.

Perform an assessment to identify the key skills needed to complete your project, and identify the gaps in your knowledge that can be filled by the team members you are working with (or team members “borrowed” from potential collaborating teams).

**Individual Product:** Annotated skill list, and 1 paragraph matching gaps in skills with “supply” of existing skills (or learning objectives) of members from other teams.

**SECOND TEAM PROJECT (Phase II) GENERATE HYPOTHESES:**

Generate testable hypotheses that can be addressed with available equipment.

**Team Product:** Outline of an Introduction of a peer-reviewed journal that justifies the hypothesis in terms of 1) filling a knowledge gap in science and 2) importance to the scientific community.

Generate testable personal learning objectives that can be addressed with available tasks.

**Individual Product:** Outline of a plan that justifies your goals for developing specific expertise in terms of 1) filling a knowledge gap in your team and 2) importance to achieving personal and community goals.
THIRD TEAM PROJECT (Phase III) DESIGN METHODS:

Plan an experimental study and develop a detailed protocol to generate data to validate your hypothesis.

Product: Methods section of a manuscript to be submitted to a peer-reviewed journal to address your hypothesis.

Develop a personal work plan to generate experiences to achieve the learning objectives and goals of you and your team.

Individual Product: A plan of work to be reviewed by you team members.

FOURTH TEAM PROJECT (Phase IV) EVALUATE DESIGN:

Evaluate preliminary experiments and refine experimental protocol.

Team Product: Revised Bibliography, Introduction and Methods for a peer-reviewed journal article.

Evaluate your contributions to the team research projects and team knowledge.

Individual Product: Answer an essay question that the university will use for programmatic review. In addition, prepare one of the following: 1) An argument how your contributions to the final research products and your contribution to team knowledge will justify co-authorship of a peer-reviewed journal article. 2) An application essay and questions (i.e., for a job, admission to an internship, grad school, med school) that uses the experience of the program as an argument for acceptance.

Americans with Disabilities Act (ADA)

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 845-1637. For additional information visit http://disability.tamu.edu.

Special Note Concerning Students with Disabilities and Learning Differences

Whether or not a student is registered with Disability Services, rooms are available for those who would perform better given quiet to concentrate or flexibility to get up and move around. All attempts have been made to incorporate the principles of “Universal Design” in lab activities and online resources. Computers and experimental equipment are available that can be customized for particular student needs. We expect active participation of all students to help us make the lab accessible and inclusive so that the diverse talents of all participants can be fully engaged.

Academic Integrity

“An Aggie does not lie, cheat, or steal, or tolerate those who do.”

For additional information please visit: http://aggiehonor.tamu.edu

Special Note Regarding Scientific Integrity

Whether or not a student has satisfied minimal requirements of academic integrity for fairly earning a grade, there are heightened expectations for behavior arising from the special nature of this program. Program activities are focused on the discovery of new knowledge that has the potential for publication in the peer-reviewed literature. Because published original research must be novel, correct, and important, it is necessary to ensure that due diligence is done to identify and give due credit to previously-published research that impacts the claim for novelty, correctness or importance of your results. Furthermore, students must follow scientific standards of a particular society sponsoring a scientific conference or archival journal that governs whether a contribution to joint work requires co-authorship.