Biomedical Sciences

Assessment Plan for the MS and/or PhD Program

PLO #1 To gain a comprehensive knowledge of human physiology and biological basis of disease.

**Direct Evidence**: In the Ph.D. Program in Biomedical Sciences, graduate students acquire a broad understanding of human disease, therapeutics and design of predictive experimental model systems through an innovative and rigorous program that integrates aspects of the UCR School of Medicine curriculum with mentored research and critical analysis of research-based modeling of human pathophysiology (BMSC 232 (FALL), 233 (WINTER), 234 & 235 (SPRING)).

The students receive a letter grade on the final comprehensive exam for each course.

**Indirect Evidence**: Exit survey (Appendix 2) by 1st year graduate students; feedback from Graduate Advisory Committee (GAC) and Medical School Block Coordinators

**Year to be Assessed**: Every academic year

**Participants**: All 1st year graduate students; Graduate Advisory Committee (GAC) and Medical School Block Coordinators.

**Process**: Each medical curriculum course is of ~8-week duration followed by two days of finals (7-14 units per course). Progress during the course is monitored by online weekly self-assessments (with results reported to the individual student, the course director and the graduate advisor).

**Targets**: Each medical curriculum course must be completed with a B or higher before the next course can be taken.

PLO #2 To learn how to “unlock” this didactic medical curriculum and gain practical knowledge on how to integrate this information with peer-reviewed scientific literature.

**Direct Evidence**: The first year students are required to complete three consecutive quarters of Topics in Biomedical Research (BMSC 260 series). Course grade is assigned based on weekly presentations, participations in the group discussions and final oral or written presentations.

**Indirect Evidence**: Student and faculty feedback; Exit survey

**Year to be Assessed**: Every academic year

**Participants**: All 1st year graduate students; faculty instructors, GAC.

**Process**: This series of problem based learning sessions are organized into six 5-week blocks that begin with the literature presentation of a specific human disease.
Small groups of students (4-8) led by a faculty facilitator identify and explore the theoretical and practical aspects of designing and interpreting experimental models of human pathophysiology. The six disease topics are chosen to explore different human physiologic systems and therapeutic needs.

**Targets:** Students should have a grounding in basic research principles: an understanding of how to review the literature, develop hypothesis, design experiments and effectively convey the results of the experiments though oral and written presentation.

**PLO #3 To gain practical laboratory skills**

**Direct Evidence:** Students are expected to complete at least 2 quarters of lab rotations incorporating either 5 or 10-week periods in different labs learning techniques and demonstrating their ability to complete small research projects (BMSC261). By the end of the 1st year it is expected that the student will be accepted into one of the labs they completed a rotation in for their thesis work. Subsequent written evaluations of student’s progress and skills are conducted by the guidance committee and mentor yearly.

**Indirect Evidence:** Reports to the graduate advisor from the guidance committee, faculty mentor and students. Exit survey.

**Year to be Assessed:** Every academic year

**Participants:** Graduate faculty mentors and guidance committees

**Process:** Guided by their scientific interests, students identify potential rotation labs with the help of the graduate advisor. Once a thesis laboratory is identified, a guidance committee is formed composed of at least the thesis mentor and two other participating faculty members. Yearly reports are submitted describing achievements with critical assessment of progress and expectations. The assessment of the success of PLO #3 is noted by students being accepted into thesis labs, mastering necessary lab techniques, passing the qualification exam, research publications in peer-reviewed journals and defending thesis.

**Targets:** Students should gain a breadth of techniques, scientific knowledge and ability. In addition an aim is to interact with several faculty and associated lab personnel within and outside the graduate program at UCR and outside the University expanding their own scientific network.

**PLO #4 Be able to critically read, understand and evaluate peer-reviewed scientific literature**

**Direct Evidence:** Grade in BMSC 260: Topics in Biomedical Research (problem-based learning); BMSC 252 (FALL, WINTER, SPRING) GENERAL SEMINAR IN BIOMEDICAL SCIENCES and BMSC 222 Journal club style class that have a critical journal club basis. Student progress is assessed by successful pass of BMSC 260 and oral qualification exam.
Indirect Evidence: Annual progress reports from the guidance committee and thesis mentor.

Year to be Assessed: Annually

Participants: Graduate students. Faculty mentors and guidance committee, Graduate Advisory Committee.

Process: As discussed in PLO#2 BMSC 260 will train and evaluate students in their ability to critically read and understand the literature. At least one review article is generated in this class requiring significant consolidation and critical analysis of the literature. Throughout their graduate career students have the option to take BMSC 222 that has been offered at least once a year for the past 7 years. BMSC 222 is an intensive journal club style class in which students take it in turns to facilitate the discussion of an important and recently published article in their field. PLO#4 is also a major portion of the qualification exam taken in summer between their second and third year. The qualification exam consists of a written portion in the style of a NIH F31 grant application based on their thesis research. This is followed by an oral exam on their proposal. An understanding of the scientific literature background for their thesis work needs to be demonstrated in both the written and oral portion of the exam.

Targets: Students are expected to fully understand the diversity of scientific literature and how to access it. They should also understand the peer-review process and be able to critically evaluate primary journal and review articles. By the end of the second year, and continuing throughout their training, a broad and in depth understanding of the primary literature within their field is expected.

PLO #5 Integrate and synthesize ideas

Direct Evidence: Grade in BMSC 260; Successful pass in the qualification exam.

Indirect Evidence: Annual progress reports from the guidance committee and thesis mentor, obtaining external funding, publishing papers in peer-reviewed journals, defending thesis and finding post-PhD employment.

Year to be Assessed: Annually

Participants: All graduate students

Process: PLO #5 will be assessed similarly to PLO#4 judging the student’s ability to integrate and synthesize scientific ideas through BMSC 260 and the process of passing the qualification exam. Yearly assessment of the progress the student makes in these concepts is also reported on by the thesis mentor and collected by the graduate advisor.

Targets: Students should be able to use their broad based medical knowledge gained in the first year curriculum and integrate it into their research. Students should be able to understand fundamental concepts in biomedical science.
PLO #6 Identify and evaluate novel and relevant research questions

**Direct Evidence:** Grade in BMSC 260; Successful pass in the qualification exam. Obtaining external funding.

**Indirect Evidence:** Participation in BMSC 252 and 254. Annual progress reports from the guidance committee and thesis mentor. Exit survey.

**Year to be Assessed:** Annually

**Participants:** Guidance committee and thesis mentor; Graduate Advisory Committee (GAC)

**Process:** As with PLO #4 and 5, PLO #6 is best assessed using the small problem based learning class currently in the first year, the qualification exam at the end of the second year followed by annual reports from the mentor and advisory committee.

**Targets:** Students should be able to generate biomedically relevant research questions. By the middle of their second year they should have sufficient background and training in their thesis lab that they can start to draft specific aims for their qualification proposal. Their written qualification proposal, although directed by the thesis mentor, should come from the student. Following successful completion of the exam students should submit their proposal as a F31 to NIH. In addition it is expected that with increasing confidence students should be asking questions during seminars presented by their peers, faculty and outside speakers.

PLO #7 Develop appropriate and effective research strategies

**Direct Evidence:** Grade in BMSC 260; Grade in Fall quarter of BMSC 254; Successful pass in the qualification exam. Success in obtaining external funding.

**Indirect Evidence:** Annual progress reports from the guidance committee and thesis mentor. Exit survey.

**Year to be Assessed:** Annually

**Participants:** Instructor's for BMSC 260 and 254. Guidance committee and thesis mentor; student and faculty feedback; Graduate Advisory Committee.

**Process:** As with developing novel research questions (PLO #6) an understanding of how to generate effective research strategies initially comes from BMSC 260 followed by mentorship from the guidance committee and thesis mentor. It is assessed thoroughly during the qualification exam.

**Targets:** Students should fully understand appropriate techniques used to answer their research questions. A fundamental comprehension of experimental design, the use of controls; statistical analysis; pitfalls and alternative approaches should all be understood by the student.
PLO #8 Communicate clearly and effectively

**Direct Evidence:** Grade in BMSC 260 and BMSC 254; Successful pass in the qualification exam.

**Indirect Evidence:** Annual progress reports from the guidance committee and thesis mentor; Successful thesis defense; attaining a position post PhD. Exit survey.

**Year to be Assessed:** Annually

**Participants:** Guidance committee and thesis mentor; Graduate Advisory Committee; graduate students

**Process:** One of the most important aspects in science is an ability to communicate in various forums. This includes writing and oral presentations. The strongest examination of this is during the qualification exam requiring the student to communicate research questions and strategies in the written form followed by a \(~30-40\text{min}\) oral presentation. Throughout their graduate career students are required to present “research in progress talks” in BMSC 254 during the winter and spring quarters. Senior students are expected to give a 30min presentation in the winter quarter and first and second year students give 15min presentations in the Spring quarter. These presentations take place in front of all students and attending graduate faculty. Students are expected to answer questions during and after their presentation.

**Targets:** Students should be able to write well and give clear presentations that are appropriate for the time frame. They should be able to communicate their research questions, data and significance in a manner that all biomedical scientists can understand.

PLO #9 To train students in appropriate scientific conduct as mandated by the NIH.

**Direct Evidence:** Grade in BMSC 254 Fall quarter.

**Indirect Evidence:** Annual progress reports from the guidance committee and thesis mentor. Success in obtaining external funding. Exit survey.

**Year to be Assessed:** Annually

**Participants:** All graduate students and faculty, BMSC 254 instructors, Graduate Advisory Committee

**Process:** Fall quarter BMSC 254 course covers practical aspects of scientific research and the philosophy of science, from data collection/presentation and laboratory notebooks to the concept of a paradigm and hypothesis testing to bioethics and professionalism. The course consists of a set of didactic lectures, workshop sessions and guest speakers from different scientific professions. This course is designed to fulfill the NIH requirement for instruction in the responsible conduct of research. This course is taken each year with senior students helping to mentor the junior students in the workshop sessions.
**Targets**: Students will learn policies regarding research on human subjects, vertebrate animals and safe laboratory practices, be aware of contemporary ethical issues in biomedical science. Students will be able to apply appropriate lab standards to their research from data collection/presentation and laboratory notebooks to the concept of a paradigm and hypothesis testing to bioethics and professionalism.

**PLO #10 To train students in time management skills.**

**Direct Evidence**: Completion of PhD requirements on time. Abstract submissions. Grant submissions.

**Indirect Evidence**: BMSC 252 Seminar attendance, guidance committee and thesis mentor feedback.

**Year to be Assessed**: Annually

**Participants**: All students. Guidance committee and thesis mentor; Graduate Advisory Committee

**Process**: There are certain requirements to be met throughout the graduate school. These include the qualification exam, TAships and final thesis defense.

**Targets**: Students should be able to structure their time to allow sufficient planning and to meet important deadlines that will be critical in their future careers including attendance at meetings and interviews and the more complex planning required for grant submission. The qualification exam is expected to take place at the end of the second year but needs to be conducted prior to the end of the students third year. It is expected that the thesis completion and graduation will occur within 5 years.

**PLO #11 To produce scientists that are able to teach and convey research and scientific information.**

**Direct Evidence**: Grade in BMSC 302 Directed teaching, BMSC 254, BMSC 260 and BMSC 222.

**Indirect Evidence**: Student TAship evaluations and faculty feedback

**Year to be Assessed**: Annually

**Participants**: Medical students and block coordinators; guidance committee and thesis mentor; BMSC 254/260/222 instructors, GAC.

**Process**: In addition to monitoring the ability of students to convey research and scientific information within our current curriculum in the form of oral presentations (BMSC 254; 260 and 222) the ability to teach is assessed (BMSC 302). Senior students are also expected to take a lead role in BMSC 254 during the Fall quarter in the workshop sessions. Students are also required to take one quarter of TAship. Until recently the Biomedical Sciences program has had to rely on our students gaining such positions through CNAS, which was on occasion difficult, however in the past year we have developed our own BMSC 302 Directed teaching course.
This allows our students to help during the first year of medical school classes. Having been through the curriculum in their first year, second year and senior students help block coordinators run labs and assessment reviews for the first year medical students.

**Targets:** Students should be able to concisely and clearly explain fundamental concepts to trainees. It is expected that they have the knowledge and confidence to do so in a convincing manner.

**PLO #12 Be able to critically access, understand and use NCBI databases**

**Direct Evidence:** Grade in BMSC 290: NCBI Training Workshop Student progress is assessed by successful pass of BMSC 290.

**Indirect Evidence:** BMSC 290 attendance. Exit survey

**Year to be Assessed:** Annually

**Participants:** Graduate students and undergraduate students. Faculty mentors and Graduate Advisory Committee.

**Process:** This workshop is intended to help students gain hands-on experience with the resources and tools at the NCBI website, and to learn how to explore these resources and apply these tools in their specific research area.

**Targets:** The goal is to equip biomedical students with the information skills necessary to work with biomedical research literature and genomic databases.

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### CURRICULUM MAP – MASTERS AND/OR PhD

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<tr>
<th>Course</th>
<th>PLO#1 Knowledge of human physiology and disease</th>
<th>PLO#2 Use of medical knowledge in research</th>
<th>PLO#3 Laboratory Skills</th>
<th>PLO#4 Critical reading and evaluation of peer-reviewed scientific literature</th>
<th>PLO#5 Integrate and synthesize ideas</th>
<th>PLO#6 Identify and evaluate novel and relevant research questions</th>
<th>PLO#7 Develop appropriate and effective research strategies</th>
<th>PLO#8 Communicate clearly and effectively</th>
<th>PLO#9 Training in scientific conduct as mandated by the NIH</th>
<th>PLO#10 Training in time management skills</th>
<th>PLO#11 To teach and convey research and scientific information</th>
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[I= introductory (for graduate level); D= developed; M= mastery]
Appendix 1: TAship Evaluation Form: The following form is designed to evaluate the performance of Teaching Assistants within the School of Medicine.

**Professionalism:** The student is on time for meetings, labs, and other engagements related to their assigned duties. The student is appropriately attired, and appropriately interacts with faculty, staff, and peers.

**Directions:** Please rate student **professionalism** based on the following rating scale:

- **Not Demonstrated:** The student is always or almost always late to meetings, labs and courses, and may frequently fail to respectfully interact with faculty, staff, and peers.
- **Basic:** The student is sometimes late to meetings, labs and courses, and may occasionally fail to respectfully interact with faculty, staff, and peers.
- **Focused:** The student is rarely late to meetings, labs and courses, and rarely fails to respectfully interact with faculty, staff, and peers.
- **Refined:** The student is consistently on time to meetings, labs and courses, and usually respectfully interacts with faculty, staff, and peers.
- **Advanced:** The student is always to almost always on time to meetings, labs and courses, and always to almost always respectfully interacts with faculty, staff, and peers.

**Productivity:** The student actively works to complete assigned tasks, and takes initiative on assignments by improving task related processes and products.

**Directions:** Please rate student **productivity** based on the following rating scale:

- **Not Demonstrated:** The student never to almost never actively works to complete tasks, and never to almost never takes initiative to improve task oriented processes, and products.
- **Basic:** The student rarely actively works to complete tasks, and rarely takes initiative to improve task oriented processes, and products.
- **Focused:** The student occasionally works to complete tasks, and occasionally takes initiative to improve task oriented processes, and products.
- **Refined:** The student frequently works to complete tasks, and frequently takes initiative to improve task oriented processes, and products.
- **Advanced:** The student always to almost always works to complete tasks, and always to almost always takes initiative to improve task oriented processes, and products.

**Communication:** The student responds to email in a timely manner. The student also follows directions well, and openly discusses both successes and challenges associated with their assigned tasks with their supervisors.
Directions: Please rate student **communication** based on the following rating scale:

- **Not Demonstrated:** The student never to almost never responds to email in a timely manner. The student never to almost never follows directions and fails to discuss the successes and challenges associated with their assigned tasks.

- **Basic:** The student rarely responds to email in a timely manner. The student rarely follows directions and rarely discusses the successes and challenges associated with their assigned tasks.

- **Focused:** The student occasionally responds to email in a timely manner. The student occasionally follows directions and occasionally discusses the successes and challenges associated with their assigned tasks.

- **Refined:** The student frequently responds to email in a timely manner. The student frequently follows directions and frequently discusses the successes and challenges associated with their assigned tasks.

- **Advanced:** The student always to almost always responds to email in a timely manner. The student always to almost always follows directions and discusses the successes and challenges associated with their assigned tasks.

**Quality of Work:** The student completes assigned tasks at an expected level of quality and quantity required for use.

Directions: Please rate student **quality of work** based on the following rating scale:

- **Not Demonstrated:** The student never to almost never completes assigned tasks at an expected level of quality and quantity required for use.

- **Basic:** The student rarely completes assigned tasks at an expected level of quality and quantity required for use.

- **Focused:** The student occasionally completes assigned tasks at an expected level of quality and quantity required for use.

- **Refined:** The student frequently completes assigned tasks at an expected level of quality and quantity required for use.

- **Advanced:** The student always to almost always completes assigned tasks at an expected level of quality and quantity required for use.