College of Continuing Education
University of Minnesota

Master of Biological Sciences Graduate Program
Educational Goals and Outcomes

Background
The Master of Biological Sciences graduate program is a professional master’s program designed primarily for working adults who wish to advance their knowledge in the biological sciences and would like to use this experience to enhance or change the course of their careers. There are currently about 100 graduate students in the program. All students complete 30 semester credits of graduate course work that include a required introductory course and foundational courses in the biological sciences; the remaining credits are used for courses in the student’s self-designed area of concentration. The program offers Plan B and Plan C options for completing the degree. In the Plan B option, students complete an intensive research project with a faculty member, write a Plan B paper, and defend the project before a 3-member committee. The Plan C option is more course-intensive, but also requires completion of an in-depth paper and an oral presentation and defense of their paper. The graduate faculty members represent several colleges on campus and serve as mentors or committee members for the Plan B students.

MBS Learning Outcomes
At the time of receiving the MBS degree, students will:
- Master a body of knowledge in the biological sciences and have a thorough understanding of the scientific method and its application.
- Locate and critically evaluate the primary literature.
- Communicate scientific information effectively in both written and oral forms.
- Understand the necessity and importance of bioethics in science.

Achieving the Learning Outcomes
1. Master a body of knowledge in the biological sciences and have a thorough understanding of the scientific method and its application.
Students complete foundational courses in biochemistry, in molecular and cellular biosciences, and in environmental and population biology. The selection of foundational courses depends on the student’s academic background and professional experiences. Students choose an area of concentration in the biological sciences and select the rest of the courses in their program to support that area of interest. Therefore, each student has an individualized degree plan that takes into account their backgrounds, interests, and/or professional goals.

2. Locate and critically evaluate the primary literature.
At the start of their program, all students take the introductory course where they are introduced to library resources and scientific writing. At the end of their program, students in the Plan B option write their Plan B Project paper that requires a thorough literature review to provide background to the project, position their project in the field, and discuss its significance. If possible, such work should be considered for future publication. Students in the Plan C option write an intensive paper that requires a thorough literature review, a critical examination of a recent article from the primary literature within their area of concentration, and a discussion of logical next steps within this area of investigation.

3. **Communicate scientific information effectively in both written and oral forms.**
   All students complete a scientific writing project and give an oral presentation of their project in the required introductory class. Students in the Plan B option write an intensive Plan B Project paper under the direction of a faculty member and give an oral presentation of the project to their faculty committee during the defense. Students in the Plan C option write an intensive paper with considerable instructor input and peer review and give an oral presentation and defense of their paper. The quality of the Plan B and Plan C papers and presentations is critical to student success in this program. In addition, Plan C students are required to take a graduate seminar course in which they write reviews of seminars attended and peer review other student’s reports. Plan B students can participate in the seminar course as well.

4. **Understand the necessity and importance of bioethics in science.**
   Ethical conduct is an important component of all graduate education. All students are introduced to central issues of bioethics in the introductory class. In addition, all students are required to complete formal training in bioethics through an on-campus course, a workshop, or an online training module. Students can choose a bioethics option that best matches their area of interest.

**Assessment**
Assessment of the learning outcomes takes place in several ways. Mastering a body of knowledge in the biological sciences is reflected in the grades earned in course work. All students demonstrate abilities to critically evaluate the primary literature when writing their Plan B Project paper or Plan C Capstone paper. Communicating in both written and oral forms is accomplished through the written project papers and the oral presentations required of all students in the introductory course and in the Plan B or Plan C final course. Topics in bioethics are introduced in the introductory class, and a more in-depth treatment of the discipline takes place in courses, workshops or online training that are completed as part of the program’s bioethics requirement. Successful completion of program requirements provides evidence that the learning outcomes were achieved.

Another important assessment tool is the annual review that is carried out for each student in the program. The course work, program plan, and progress toward degree completion are reviewed, and each student receives feedback on their status in the program. In addition, meetings with the program advisor, administrator and/or DGS are used to discuss potential problems or address questions and concerns. These frequent reviews are essential for the MBS program. While there are common requirements and outcome expectations, much of the program is individually designed for each student to support their interests and goals.
Tracking students after they complete the degree is a future program initiative intended to assess whether students accomplished the goals they articulated while in the MBS program. An alumni database will be established, and former students will be surveyed to inquire about completion of additional degrees and their current employment.
**Review Process**

Review of the learning outcomes and assessments involved the MBS Advisory Committee, the graduate faculty, and the students currently enrolled in the program.

**Advisory Committee:** The program’s Advisory Committee, which is composed of faculty, program staff, and a representative from private industry, met to discuss the educational goals for the MBS program and developed the learning outcomes and assessment approaches that are outlined in the current document.

**Graduate Faculty:** A draft of this document was sent to all members of the graduate faculty to solicit their comments. Their feedback was used to clarify the writing and to strengthen the statements for learning outcome #3 regarding communication skills.

**Students:** A 16-question survey was sent to all active students in the program. The survey asked students to evaluate the learning outcomes and ways to achieve the outcomes using a five-point likert scale (strongly agree to strongly disagree) and to submit free-form comments regarding each learning outcome. We received 41 responses from 99 students in the program. The vast majority of students either strongly agreed or agreed with the learning outcomes and the ways they are achieved. Some of the comments suggested changes to the program’s introductory course and annual evaluation assessment, and these suggestions will be discussed further for future program modifications to improve the student experience.

**Plans for Future Review**

We intend to engage students, graduate faculty and the MBS Advisory Committee in a review of this document annually, which will provide an opportunity to revise program policies and procedures as needed if the goals or assessments are modified. Revisions will be based on feedback from students in the program who will be surveyed for their opinions of the goals and outcomes as they reflect on their experiences in the program. In addition, the graduate faculty and Advisory Committee will be asked to review the goals and outcomes and suggest modifications.