Master of Science, Biological Sciences

Educational Effectiveness

Assessment Plan

**Version 2**

**Adopted by**

**The Biological Sciences faculty: 9/06**

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# Introduction

This document defines the educational objectives and expected outcomes for the Master of Sciences in Biological Sciences program, and outlines a plan for assessing the achievement of the stated objectives and outcomes.

The objectives of the Master degree program are to ensure that candidates for this degree have (1) mastered the fundamental concepts of Biological Sciences, including cell and molecular biology, genetics, physiology, evolution and ecology, (2) a working knowledge of the principles of the scientific method, of the technology and methodology of biological research, of the quantitative analysis of research data and information, (3) will be capable of writing a publishable scientific paper, and (4) will demonstrate mastery of at least one focus area or sub-discipline in biological sciences.

The faculty originally met and accepted the objectives, outcomes, and assessment processes on Sept. 9, 2002, and the assessment plan and survey was first administered to our students in the spring of 2002. We have repeated the survey in 2005, 2007 and 2008, with revisions to the survey in 2008. The faculty in Biological Sciences have reviewed the assessment statistics for the past year, and have agreed to continue with the assessment program as implemented for the next year.

Approved by the Biology Graduate Committee April 28, 2008

# Program Mission

The mission of the M.S. Program in Biological Science is to train developing life scientists to discover new knowledge through rigorous scientific experimentation and critical reasoning.  The program will train students in the theory and practice of biology and will prepare students for careers in the life sciences, including basic and applied research fields.

To achieve this mission, the Biological Science M.S. Program will:

* Provide quality graduate instruction that teaches the practical and theoretical basics of biological research, including experimental design and field-specific content.
* Provide training in skills required for careers in science, including critical thinking, scientific writing, grantsmanship, classroom teaching, and others that in combination will promote success in academia, applied research or other scientific careers.
* Provide support and mentorship for graduate student research and creative activities.
* Provide well-equipped laboratories or other facilities essential to productive student research.

# Program Objectives

The educational objectives of the Master of Science, Biological Science are to produce graduates who:

* Have mastered the fundamental concepts of Biology, including cell and molecular biology, genetics, physiology, evolution, and ecology
* Will have a working knowledge of the principles of scientific methodology, of the methods and technology of biological research, of quantitative analysis of scientific data, and will be capable of writing a publishable scientific paper.
* Will have a demonstrated mastery of at least one focus area within Biology or Biochemistry.
* Are prepared for a career in Biological Sciences, or are prepared to pursue more advanced research opportunities (e.g., PhD or postdoctoral programs).

# Program Outcomes

The specific educational outcomes that support the program objectives are to produce graduates who are able to:

* Demonstrate knowledge and understanding of the concepts, mechanisms, and vocabulary of the major thematic areas of biological sciences, including:
  + Cell and molecular biology
  + Evolution
  + Genetics
  + Physiology
  + Ecology
* Demonstrate the ability to conduct original scientific research, including a knowledge and understanding of:
  + The principles of scientific methodology
  + Methods and technology of biological research
  + Quantitative analysis of scientific data
  + Writing a publishable scientific paper
  + A mastery of at least one focus area or sub-discipline of Biological Sciences

# Assessment Tools

A description of the tools used in the assessment of the program objectives and their implementation are summarized in Table 1. The tools and their relationships to the program objectives are listed in Table 2.

A description of the tools used in the assessment of the program outcomes and their implementation are summarized in Table 3. The tools and their relationships to the program outcomes are listed in Table 4.

There is a separate appendix for each tool that describes the factors that affect the results and give examples of the tools and how they will be implemented.

**Table 1**

## Program Objectives Assessment Tools and Administration

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tool** | **Description** | **Frequency/ Start Date** | **Collection Method** | **Administered by** |
| <Tool #1> | Oral Defense | Fall/02 – once per candidate | Oral Exam | Department Faculty |
| <Tool #2> | Thesis Defense | Fall/02 – once per candidate | Oral Exam | Department Faculty |
| <Tool #3> | Graduate Alumni Survey | Fall/02 –1/Yr | Mail Survey or online | Department Staff and Faculty |
| <Tool #4> | Graduate Publication Record | Fall/06 –1/Yr | Mail Survey | Department Staff and Faculty |

**Table 2**

## Association of Assessment Tools to Program Objectives

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Oral Defense | Thesis Defense | Alumni Survey | Publication record |
| Objective 1 – Mastery of fundamentals of biology | 1 | 1 | 0 | 0 |
| Objective 2 - Mastery of methods of Scientific Inquiry | 1 | 1 | 0 | 0 |
| Objective 3 – Mastery of at least one focus area in Biological Sciences | 1 | 1 | 0 | 0 |
| Objective 4 – Well-prepared for career in Biological Sciences | 0 | 0 | 1 | 1 |

0 = Tool is not used to measure the associated objective.

1 = Tool is used to measure the associated objective.

**Table 3**

## Program Outcomes Assessment Tools and Administration

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tool** | **Description** | **Frequency/ Start Date** | **Collection Method** | **Administered by** |
| <Tool #1> | Oral Defense | Fall/02 –once per candidate | Oral Exam | Department Faculty |
| <Tool #2> | Thesis Defense | Fall/02 –once per candidate | Oral Exam | Department Faculty |
| <Tool #3> | Graduate Alumni Survey | Fall/02 –1/Yr | Mail Survey | Department Staff and Faculty |
| <Tool #4> | Graduate Publication Record | Fall/06 –1/Yr | Mail Survey | Department Staff and Faculty |

**Table 4**

## Association of Assessment Tools to Program Outcomes

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Oral Defense | Thesis Defense | Alumni Survey | Publication Record |
| Outcome 1A – Cell/Molecular Biology | 1 | 0 | 0 | 0 |
| Outcome 1B - Evolution | 1 | 0 | 0 | 0 |
| Outcome 1C – Genetics | 1 | 0 | 0 | 0 |
| Outcome 1D – Physiology | 1 | 0 | 0 | 0 |
| Outcome 1E – Ecology | 1 | 0 | 0 | 0 |
| Outcome 2a – Scientific Methodology | 0 | 1 | 0 | 0 |
| Outcome 2b – Mastery of Methods and Techniques of Biological Research | 0 | 1 | 0 | 0 |
| Outcome 2c – Quantitative analysis of biological data | 0 | 1 | 0 | 0 |
| Outcome 2d – Mastery of Scientific Writing | 0 | 1 | 0 | 1 |
| Outcome 2e – Mastery of at least one focus area in biology | 0 | 1 | 1 | 1 |

0 = Tool is not used to measure the associated objective.

1 = Tool is used to measure the associated objective.

# Assessment Implementation & Analysis for Program Improvement

## General Implementation Strategy

The assessment process for the Master of Science in Biological Sciences is as follows. All candidates for the degree must pass both an oral exam and a defense of their thesis research before being awarded the degree. The examination process occurs at the end of the student’s program of work at UAA, and involves (1) a public presentation of the research conducted (the research seminar) followed by (2) an oral/thesis defense. The oral defense is conducted by the student’s graduate committee, and covers all aspects of the subject matter of biological sciences, including the subjects listed in the program outcomes above. The thesis defense occurs simultaneously, and focuses on the research conducted by the student and all aspects of the thesis submitted to the committee. The oral examination generally lasts from 1 (rarely) to 4 hours, and typically averages around 2 hours in length.

## Method of Data Analysis and Formulation of Recommendations for Program Improvement

The outcome of the oral and thesis defense is Boolean: either the candidate passes the examination or he/she fails. Failure may entail further research or coursework, with a single chance for reexamination. General productivity and scientific writing skills of students are also assessed by tracking graduate student publication rates (in peer reviewed journals); publication is not required for completion of the M.S. and therefore this measure does not apply to every student.

## Modification of the Assessment Plan

The faculty will meet periodically and decide whether to alter the assessment process. Changes may be made to any component of the plan, including the objectives, outcomes, assessment tools, or any other aspect of the plan. The assessment program coordinator will oversee the documentation of these changes, if any, and submit the revisions to the faculty for approval. The modified assessment plan will then be forwarded to the dean/director’s office and the Office of Academic Affairs.

# Appendix A: Graduate Alumni Survey

Tool Description:

The Graduate Alumni Survey (attached below) is a short survey we send to all of our graduates after they graduate and after 5 years post-graduation, to determine how our graduates are employed, whether their graduate degree from the Department was effective in preparing them for their future, and how satisfied they were with our program.

Factors that affect the collected data:

The data collected are primarily qualitative in nature, and do not assess the competency of our graduates per se (this is accomplished through the Oral Exam and Thesis defense process).

How to interpret the data:

Interpretation of the survey responses is relatively straightforward. We are primarily interested in tracking (1) the time taken to obtain the degree, (2) the work history of the alumnus, and (3) the level of satisfaction of the alumnus in her/his graduate program at UAA. These statistics will be tracked over time to determine if some aspects of the program are in need of change. The survey also includes open-ended questions for students to comment on their perceptions of program strengths and areas needing improvement.

Graduate Alumni Survey:

Dear alumnus,

The UAA Department of Biological Sciences is conducting a survey to assess our graduate program. We want to know how you are doing! We would particularly like to know how you have benefited from your degree. Would you please take a moment to answer the following survey?

1. What year did you receive your degree from UAA? \_\_\_\_\_\_\_\_\_\_
2. Who was your thesis advisor? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Were you enrolled (predominantly) full time or part time during your degree program?
4. How long did it take you to finish your degree? \_\_\_\_\_\_\_\_\_\_\_\_\_
5. What were you doing 1 year after you received your degree from UAA?

\_\_\_\_\_ pursuing another degree.

\_\_\_Ph.D. \_\_\_Masters

subject: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_ working in a biology-related field (include postdocs).

Job title: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Where? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

­­­­\_\_\_\_\_ other. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What were you doing 5 years after you received your degree (if applicable)?

\_\_\_\_\_ pursuing another degree.

\_\_\_Ph.D. \_\_\_Masters

subject: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_ working in a biology-related field (include postdocs).

Job title: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Where? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

­­­­\_\_\_\_\_ other. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What are you doing now?
2. How useful have you found your UAA degree to be?

Extremely useful Not useful

1 2 3 4 5 6

1. What do you think are the greatest strengths of the UAA Biology MS program?
2. Do you have any suggestions for ways we could improve UAA’s Biology MS program?