

STUDENT LEARNING ASSESSMENT PROGRAM SUMMARY FORM

Program Name: Master’s Degree in Biological Sciences

Department: Biological Sciences

College: College of Liberal Arts and Sciences

Submitted by: Britto P. Nathan

Part 1:

<p>CGS Learning Goal #1 A depth of content knowledge</p>	<p>Program Learning Goal(s): Students will demonstrate a depth of content knowledge appropriate to the Master's level and preparative to successfully fill employment opportunities or enter doctoral or professional programs in Biological Sciences.</p>
<p>How are learners assessed?</p>	<p>MS BIO provides ample opportunities for students to learn theoretical and analytical skills at Master’s level. In addition, students in the thesis and non-thesis options receive hands-on field and laboratory experience from faculty who are experts in their field. During laboratory exercises and thesis research projects students are assessed for their technical and analytical skills. Comprehensive knowledge of the subject matter is assessed both in theoretical- and laboratory-based courses. In addition, analytical knowledge is evaluated on a 5-point scale during presentations. Also, students complete a mandatory exit questionnaire at graduation that assesses various learning objectives on a 5-point scale.</p> <p>M.S. capstone experience (thesis/research defense, or independent research presentation) that includes an assessment of subject-specific knowledge and a general comprehensive examination.</p> <p>Graduate student employment or admission to doctoral and professional programs.</p> <p>Graduate assistants are evaluated, over the course of each year, by faculty to whom they are assigned as course assistants.</p> <p>Student and peer evaluations of students in GTAP (Graduate Teaching Assistant program).</p>

What are the expectations for the students?	Graduate students expected to obtain knowledge that will make them a strong candidate for employment opportunities and for entering doctoral and professional programs.
What are the expectations for the program?	<p>Graduate students will demonstrate evidence of proper methodology in research projects and competence in graduate courses (as measured by minimum 3.00 GPA required for good graduate standing).</p> <p>More than 95% of graduate students in the thesis option will pass the defense and oral comprehensive examination on the first attempt.</p> <p>Graduate students will secure full-time employment or be admitted to doctoral and professional programs following graduation</p> <p>At the end of each semester, graduate assistants are reviewed by faculty mentors to whom they are assigned.</p> <p>100% of students (maximum of 4) participating in the GTAP program each year are expected to receive positive evaluations as related to subject knowledge.</p>
What were the results?	<p>96% (59/61) of active graduate students taking courses in AY 19-21 had GPA above the required 3.0/4.0. The average analytical thinking score was 4.8/5.0 for thesis research. 100% (32/32) of graduate students who finished in AY 19-21 passed their oral thesis/research and comprehensive examination on their first attempt.</p> <p>88.6% (52/59) of 2019-2021 graduates were employed in biology-related field or entered Ph.D. programs. We collect this data from the Exit Questionnaire.</p> <p>32 of 32 graduate assistants received positive reviews from faculty.</p> <p>There were 2 students in the Graduate Teaching Assistant Program in AY 2019-2021. They all received strong evaluations from GTAP coordinator and high scores (mean > 4.8/5) on student evaluations.</p>

<p>How are the results shared? How will these results be used?</p>	<p>Graduate Coordinator collects assessment data, perform statistical analyses, and creates graphical presentations. The coordinator routinely presents data to faculty and graduate students during faculty meetings, retreats, orientation meetings, and Graduate Student Association meetings. In addition, the presentations are also shared with faculty using the “BioServer” online portal, which provides an additional avenue for faculty feedback.</p> <p>The assessment data revealed that due to a rapid increase in our program size, from a multiyear average of about 30 students to 77 students in 2022, we need to create new graduate courses. In 2019-2021 we created 7 new graduate level courses. Also, the COVID pandemic required offering several of our new and old courses in the online format.</p> <p>The Graduate Coordinator and faculty observed that the pandemic caused distress, social, and mental issues among graduate students. We tried to alleviate these issues by offering online orientation, seminars, and virtual “gatherings”.</p> <p>In addition, the assessment data suggested that we need to create an Online MS BIO program. In 2020, we started the new MS BIO Online program. This program caters to students who are unable to attend the campus due to location, family, or their current employment situations. Presently, we have 32 students enrolled in the MS BIO Online program.</p>
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<p>CGS Learning Goal #2: Critical thinking and problem-solving skills</p>	<p>Program Learning Goal(s): Students will demonstrate critical thinking and problem-solving skills appropriate to the Master's level.</p>
<p>How are learners assessed?</p>	<p>All students in the MS BIO perform independent thesis/independent research/and online projects. Students in the thesis option will have an oral defense and oral comprehensive examination that includes an assessment of experimental design and data analysis. Students in the non-thesis and MS BIO Online options can perform independent studies under the mentorship of a faculty.</p>

	<p>Evaluation of graduate research projects, thesis proposal or independent study projects by faculty and the Graduate Coordinator.</p> <p>Writing skills are evaluated by thesis, independent study reports, and course work.</p> <p>Also, students complete a mandatory exit questionnaire at graduation that assesses various learning objectives on a 5-point scale.</p>
<p>What are the expectations for the students?</p>	<p>More than 90% of graduate students will pass the oral thesis/research defense and oral comprehensive examination on the first attempt.</p> <p>All students will prepare a thesis/independent study proposal, approved by their thesis committee, addressing methods, by end of their first semester.</p> <p>Graduate students will develop and carry out experimentally sound and technologically appropriate thesis and/or independent study projects.</p> <p>Students in the thesis option submit a comprehensive thesis of their research project. Students in the non-thesis and Online options submit an independent study report. In addition, writing skills of all students in the MS BIO are evaluated during their course work.</p>
<p>What are the expectations for the program?</p>	<p>To successfully prepare the students in critical thinking and problem solving in the complex field of Biological Sciences so the students are adequately prepared to handle coursework at PhD or professional schools or at their future workplace.</p>
<p>What were the results?</p>	<p>During 2019-21, 100% (32/32) of graduate students who finished in the time period passed their oral thesis/research and comprehensive examination on the first attempt.</p>

	<p>Graduating students demonstrated appropriate skills in research projects in thesis or independent study.</p> <p>The theses are stringently evaluated for writing skills by the students' committee members. Students rewrite the thesis until it meets the writing level of a scientific publication. Most thesis are eventually published in peer-reviewed journals. Various reports and other course work submitted by the non-thesis and online students are used to evaluate writing skills like a thesis. The assigned faculty will evaluate and assist the student to attain acceptable level of scientific writing.</p>
<p>How are the results shared? How will these results be used?</p>	<p>Faculty research mentors, graduate student committees, Graduate Coordinator. Graduate Coordinator tabulates results and shares data with faculty and students in faculty meetings, retreats, orientation meetings, and Graduate Student Association meetings.</p>
<p>CGS Learning Goal #3: Effective oral and written communication skills</p>	<p>Program Learning Goal(s): We expect our graduate students in the MS BIO to be good communicators of science to both scientific communities and non-specialist audience.</p>
<p>How are learners assessed?</p>	<p>M.S. capstone experience that includes an oral thesis/research defense and oral comprehensive examination.</p> <p>Graduate Seminar (BIO 5150)</p> <p>Student and peer evaluations of students in GTAP program</p>
<p>What are the expectations for the students?</p>	<p>More than 90% of graduate students will pass the oral thesis/research defense and oral comprehensive examination on the first attempt.</p> <p>Students will average 75% of available score on all sections of a standard rubric that evaluates content, organization, analysis, language, delivery and questions of final oral presentation.</p>

	<p>Students must assimilate and present information to their peers and faculty.</p> <p>100% of students (maximum of 4) participating in the GTAP program each year are expected to receive positive evaluations as related to communication skills.</p>
What are the expectations for the program?	The program expects the graduate students in the MS BIO program to be effective communicators.
What were the results?	<p>During 2019-21, 100% (32/32) of graduate students who finished in the time period passed their oral thesis/research and comprehensive examination on the first attempt.</p> <p>Students (n=32) earned an average score of 21 out of 24 possible points in the assessment rubric employed.</p> <p>Students (n=32) presented their own work and critiqued others in graduate seminar in 2019-21 as preparation for their final defense and future work.</p> <p>Two students participated in the GTAP program in AY 2019-21. They received strong evaluations from GTAP coordinator and >4.8 /5.0 average scores on student evaluations</p>
How are the results shared? How will these results be used?	Faculty research mentors, graduate student committees, and the Graduate Coordinator obtain and share data with the departmental faculty and graduate students. We use the data to develop new courses and modify previously offered courses to strengthen oral and written communication skills. For example, in AY 2019-21 we offered seminar courses in scientific writing and speaking.
CGS Learning Goal #4: Evidence of advanced scholarship through research and/or creative activity.	Program Learning Goal(s): Providing a strong research foundation is the corner stone of our courses and research projects.
How are learners assessed?	<p>Completion of thesis, course projects, and independent research.</p> <p>Presentations at scientific meetings and research publications.</p>
What are the expectations for the students?	Graduate students will demonstrate the ability to present and discuss evidence of original scientific research in written and oral formats.

	<p>Students are expected to present their research at university, regional, and national meetings. Students will publish results of their research in thesis and scientific journals.</p> <p>Students will submit grants to support their research.</p>
What are the expectations for the program?	To train students in research and scholarly activities.
What were the results?	<p>During 2019-21, 100% (32/32) Biological Sciences graduates that graduated published Master's theses.</p> <p>More than 48 students presented their research at professional meetings in 2019-21. Graduate students received 61% of Williams travel awards in the College of Liberal Arts and Sciences and 24% of all awards given last year to present at meetings. 100% of students in the thesis option submitted a thesis. Students published peer-reviewed scientific manuscripts of their research as either author or co-author. Publishing research paper and/or presentation at professional meetings are the ultimate measures of learning in Biological Sciences. In 2017-2019, Bio student presented their research work at 21 professional conferences and published 36 peer-reviewed articles in internationally reputable journals.</p> <p>Bio students received 62% of research grants awarded in CLAS or 41% of all research grants awarded by the graduate school last year.</p>
How are the results shared? How will these results be used?	<p>Results are shared in the faculty meeting and Graduate Students Association meetings. The results are used to motivate current and future students to be fully involved in research and scholarly activities.</p>
CGS Learning Goal #5: Ethics and Professional Responsibility	<p>Program Learning Goal(s): The graduate candidate demonstrates an understanding and respect for professional ethics in the discipline.</p>
How are learners assessed?	<p>Any research activity that involves the use of animals need to be approved by the Institutional Animal Care and Use Committee. Research projects that have environmental impact must be approved by Department of Natural Resources, Environmental Protection</p>

	Agencies, etc. Students complete CITI training offered online through the Office of Sponsored Research at EIU.
What are the expectations for the students?	Students are expected to obtain approval from appropriate governing agencies prior to initiating their research. Also, students are expected to complete the required training to perform research.
What are the expectations for the program?	All students perform research in an ethical and professional manner
What were the results?	100% of research performed by graduate students were approved/certified by governing agencies prior to initiation of the research.
How are the results shared? How will these results be used?	Students and faculty are made aware of the results via email and in meetings. The results are used to create a research environment that stringently follows protocols and methodologies used in animal and environmental research.

Part 2

Describe what your program's assessment accomplishments since your last report was submitted. Discuss ways in which you have responded to the Graduate Assessment Summary Response from last year's report or simply describe what assessment work was initiated, continued, or completed.

Our program assessment and valuable discussion with Dr. Karla Sanders suggested that a large population of students are unable to attend on-campus courses due to family, occupation, and other obligations. To serve these student population, we initiated a MS BIO Online option in 2020 AY. This program has exponentially grown to 32 students in 2022.

We are in the ninth year using a standard rubric for evaluating written and oral skills. The rubric generates numeric scores to augment our traditional holistic assessment.

Assessment Rubric

	Superior (4)	Very Good (3)	Good (2)	Acceptable (1)	Unacceptable (0)
Content	Content clearly relevant; evidence supported topic; project well based on available literature; accurately cited	Content relevant; points supported; literature cited	Content mostly relevant; lacked support for some points; adequate literature cited	Content minimally relevant; minimal support; minimal literature cited	Content not relevant; ideas not supported; literature not cited
Organization	Ideas clearly arranged; well organized; strong transitions	Conveyed ideas; logically organized; good transitions	Conveyed central idea; generally organized; adequate transitions	Ideas loosely connected; structure unclear; transitions unclear	No central ideas; no logical structure; lacked transitions
Analysis / Design	Strong evidence of critical thinking; appropriate to innovative use of statistical analysis	Consistent Evidence of critical thinking; appropriate use of statistical analysis	Some evidence of critical thinking; appropriate use of statistical analysis	Inconsistent evidence of critical thinking; appropriate even if insufficient statistical analysis	Lacks evidence of critical thinking; inappropriate or missing statistical analysis
Language	Varied sentence structure and word choice; unfamiliar	Adequate variation in sentence and word choice; unfamiliar terms easily	Some variation in sentence structure; good word choice;	Little variation in sentence structure; adequate word choice; unfamiliar	No variation in sentence structure; poor word choice; unfamiliar

	terms clearly defined	interpreted or explained	unfamiliar terms easily interpreted	terms not easily interpreted	terms not defined
Delivery / Speaking Skills	Clearly engaged audience; highly effective articulation, volume and pronunciation, polished and comfortable	Engaged audience; good articulation, volume, and pronunciation, used slides as guide	Generally engaged audience; effective articulation, volume, and pronunciation, practice but scripted	Minimal awareness of audience; minimal articulation, volume, and pronunciation, read from script	Little or no audience awareness; lack of clear articulation, volume, and pronunciation, read from slides
Questions	Clear, complete, informed answers to questions	Clear answers to questions; minimal prompting	Answered with minimal prompting or clarification	Minimal ability; incomplete or required help	Could not answer questions; or incorrect

Evaluator on committee: Y or N
Presenter:

Date:

Presentation Title:

	Superior (4)	Very Good (3)	Good (2)	Acceptable (1)	Unacceptable (0)
Content					
Organization					
Analysis					
Language					
Delivery					
Questions					

Total:

Part 3

Summarize changes and improvements in curriculum, instruction, and learning that have resulted from the implementation of your assessment program. How have you used the data? What have you learned? In light of what you have learned through your assessment efforts this year and in past years, what are your plans for the future?

The Graduate Committee has evaluated the current course rotation to ensure that it offers an appropriate mix of 4000 and 5000 level courses in field and lab-based curricula to support the diverse clientele. The process has also pointed out the ongoing issue of underrepresentation in the bench/cell/molecular areas. This evaluation has been used to increase, or at least balance, the number of cell course offerings and has been useful in faculty hiring decisions.

The department focuses on a student-specific curriculum. This allows students to tailor their coursework to suit their particular area of interest in the vast field of Biology, and we feel it is a real strength of the program. Students in the thesis option are required to take a combination of 9 hours total of research (BIO 5900) and thesis (BIO 5950). All students need to be competent in experimental design and data analysis, so we emphasize the need for an advanced statistics course or experimental design course for all students, and all students are required to take a seminar course in which they assimilate and present material relevant to their research. The seminar course rotation has been modified to alternate between a topic-based course (important for evaluation of primary literature) and a techniques-based courses (thesis proposal development, presentation skills, writing). The comprehensive knowledge exam is a critical tool in our final assessment of students. It has been useful for identifying a rare individual that has not achieved a minimum knowledge base before graduation.

We have effectively used the assessment data in the past two years to make strategic programmatic changes. These efforts have increased our program quality, which is evident from the high percentage of graduating students successfully employed in jobs related to Biological Sciences and/or admitted to doctoral or professional programs. In addition, we used the assessment data and suggestion from the Assessment Coordinator to develop a new MS BIO Online option. Moreover, we modified our course offerings to train and educate graduate students in “high-demand” areas of Biological Sciences like Biotechnology, Molecular Genetics, Immunology, and Wildlife Techniques. **Our program size has more than doubled from a decade average of 30 graduate students per year to 77 students in Fall 2022. We would like to thank the Graduate School and the Assessment Coordinators for their valuable suggestions and support.**