WICHITA STATE UNIVERSITY

Program Review Self-Study Template (Su '11 to Sp '14)

Academic unit: Biological Sciences

College: Liberal Arts & Sciences _____

Date of last review May 2013 (Su '08 to Sp '11)

Date of last accreditation report (if relevant) _____

List all degrees described in this report (add lines as necessary)

Degree: BS Biologicial Sciences _____ CIP* code: 26.0101_____

Degree: BA Biological Sciences_____ CIP code: 26.0101 _____

Degree: MS Biological Sciences _____ CIP code: 26.0101 _____

*To look up, go to: Classification of Instructional Programs Website, http://nces.ed.gov/ipeds/cipcode/Default.aspx?y=55

Faculty of the academic unit (add lines as necessary)

Name Signature

James Beck (Assistant Professor) _____ _____

George R. Bousfield (Professor) _____ _____

Donald Distler (Associate Professor) _____ _____

William J. Hendry (Professor and Chair) _____ _____

Gregory Houseman (Associate Professor) _____ _____

Mary Liz Jameson (Associate Professor) _____ _____

J. David McDonald (Professor) _____ _____

Christopher M. Rogers (Professor) _____ _____

F. Leland Russell (Associate Professor and Graduate Coordinator) _____ _____

Mark Schneegurt (Professor) _____ _____

Joe Shellhammer (Fairmount Lecturer of Biological Sciences-UP teaches > 50%)

Bin Shuai (Associate Professor)

Li Yao (Assistant Professor)_____ _____

Submitted by: William J. Hendry (Professor and Chair)_____ Date _____

1. Departmental purpose and relationship to the University mission (refer to instructions in the WSU Program Review document for more information on completing this section).

a. University Mission:

The mission of Wichita State University is to be an essential educational, cultural, and economic driver for Kansas and the greater public good.

b. Program Mission (if more than one program, list each mission):
UNDERGRADUATE PROGRAM—The Department of Biological Sciences is committed to providing high-quality teaching for both undergraduate and graduate students and a scholarship source for the university and the Wichita community. This contribution is strongly enhanced by the active scientific research programs conducted by our faculty. Those teaching and research agendas include a balance of both field/ecology and cell/molecular activities.

MASTER OF SCIENCE GRADUATE PROGRAM

The mission of the Masters of Science graduate program in the Biology Department is to provide an advanced education in biology with either a research thesis or non-thesis option. For students pursuing the thesis option, our goal is to provide high-quality mentoring in the process of designing and conducting original biological research. We seek to equip thesis graduate students with the skills to formulate original research questions, collect data required to answer those questions, and prepare research results for dissemination to the scientific community. For non-thesis MS graduate students, our goal is to provide in-depth exposure to current ideas and techniques in biology through advanced coursework and to introduce students to biology-related professions through internship or research opportunities. By providing this instruction, we prepare our graduate students for doctoral programs, professional programs related to biology, and careers in scientific research, entrepreneurship, and/or teaching.

c. The role of the program (s) and relationship to the University mission: Explain in 1-2 concise paragraphs.
UNDERGRADUATE PROGRAM—The Department of Biological Sciences supports the university mission by offering a comprehensive core curriculum that prepares our students for careers in research, environmental studies, medicine, and other post-baccalaureate studies. A student's long-term goals are taken into consideration when he/she confers with an advisor to choose between the research and seminar options of the core program as well as select major elective courses.
Additionally, we participate in the Watkins Program along with the department of chemistry, geology, and physics. We also assist the outreach mission of the Fairmount Center for Math and Science education by participating in the JASON project, the state Science Olympiad competition, and the Kansas Junior Academy of Science; all activities that focus on science and math education for middle and high school students both locally and statewide. We provide lab space and needed support to the Upward Bound Math Science TRIO summer programs. Annually, we host one of four Watkins Visiting Professors and we recruit area teachers from Kansas middle, high school, community and 4-year colleges for Watkins Summer Fellowships. All department seminars are advertised and open to the public to allow interactions among scientist and

community members. Our field station sites (Ninnescah, Sellers, and Gerber Reserves) include native and restored prairie land tracts that are used by many local community groups (boy and girl scouts, field trips by schools) and other researchers in the state to demonstrate environmental principles and concerns. Additionally, when weather conditions are appropriate, we host a BioBlitz at the Ninnescah Reserve during which interested high school students collect and identify various animal and plant species.

MASTER OF SCIENCE GRADUATE PROGRAM --A key component of the Wichita State University mission is to serve as an 'educational, cultural and economic driver' for our region and beyond. The Masters of Science program in Biology furthers this goal because the biological sciences are an important branch of learning underlying economic development and cultural/societal debate. Economic vibrancy in key industries in Kansas and nationally, such as biomedical, biofuels and agriculture, depend upon a workforce that has the ability to develop and understand new knowledge about biological systems through application of the scientific method. The MS program in Biological Sciences gives our students intensive training in interpreting and conducting original scientific research. For those students who do not pursue a career in biology, exposure to the process by which new scientific knowledge is discovered and communicated prepares them to understand scientific findings that are key to public policy debates, such as use of natural resources and developments in medicine.

d. Has the mission of the Program (s) changed since last review? ☐ Yes ☒ No
   i. If yes, describe in 1-2 concise paragraphs. If no, is there a need to change?

e. Provide an overall description of your program (s) including a list of the measurable goals and objectives of the program (s) (programmatic). Have they changed since the last review?

UNDERGRADUATE PROGRAM ☐ Yes ☒ No
MASTER OF SCIENCE GRADUATE PROGRAM ☒ Yes ☐ No

If yes, describe the changes in a concise manner.

UNDERGRADUATE PROGRAM--The Department of Biological Sciences is committed to providing high-quality instruction for undergraduate students and a scholarship source for the university and the Wichita community. Our flexible curriculum allows students to choose either a BA or BS degree with concentrations in Biology (general)/Biomedical or Ecological/Environmental/Organismal. All students take the same 5 core courses, and then can choose electives that support their long term goals. In addition, we participate in a BS field major in Biochemistry in partnership with the department of chemistry. We also support secondary science education and the Biomedical engineering programs. All these contributions are strongly enhanced by the active scientific research programs conducted by our faculty and their willingness to recruit undergraduate student participation in such contemporary research. Thus our undergraduate program supports student's endeavors that well prepare them for

careers in medicine, environmental studies, education, research and post-baccalaureate studies. (Undergraduate brochure attached in appendix)

i. Research opportunities for undergraduate students are numerous and varied. Research students work with a mentor on a specific project and build on the skills learned in teaching labs. Each student's research experience is unique and requires them to think independently and resolve challenges as they arise.

Seminar students are exposed to a broad spectrum of scientific topics presented by biology faculty, the WSU community, and invited visiting scientists. Speakers from outside the department significantly broaden our student's perception of biology's current status and where it may well go in the future.

To measure the success of our students, we propose the following goals and objectives:
GOAL # 1: STUDENTS WILL DEVELOP A BROAD KNOWLEDGE OF BIOLOGICAL CONCEPTS.

OBJECTIVE # 1: Students will demonstrate their understanding of biological processes at all organizational levels (molecular, cellular, organismal, community).

GOAL # 2: STUDENTS WILL DEVELOP THE INTELLECTUAL AND MECHANICAL SKILLS NEEDED TO COMPREHEND AND CONDUCT BIOLOGICAL RESEARCH.

OBJECTIVE # 1: Students will demonstrate: 1) their knowledge of the scientific method plus the methods of data analysis used to interpret scientific observations and 2) their ability to use contemporary scientific communication techniques.

GOAL # 3: STUDENTS WILL PARTICIPATE IN RESEARCH AND SCHOLARSHIP ACTIVITY THROUGH INTERACTIONS AMONG STUDENTS, FACULTY, AND OTHER PROFESSIONAL BIOLOGISTS IN THE COMMUNITY.

OBJECTIVE # 1: For at least one semester, students will attend and participate in research seminars given by resident and visiting biologists or they will engage in a laboratory or field research project under the supervision of resident biologists or other professional biologists in the community.

GOAL # 4: ASSESSEMENT BY THE STUDENTS WILL BE PART OF THE DEPARTMENT'S REVIEW OF THE UNDERGRADUATE PROGRAM.

OBJECTIVE # 1: Students will anonymously provide their perceptions of the strengths and weaknesses of the undergraduate major utilizing a written survey instrument. (current survey attached in appendix). The results are compiled and given to the chair for discussion with the faculty as needed.

MASTER OF SCIENCE GRADUATE PROGRAM

Learner-Centered Goals

Goal 1: Students will become familiar with current research questions and hypotheses in their field of biology.

Goal 2: Students will understand how to apply the scientific method to their particular discipline within biology.

Goal 3: Students will develop the ability to communicate effectively with other scientists about scientific research.

Learner-Centered Objectives

We state our learner centered objectives in terms of the educational opportunities and careers for which graduates from our MS program will be prepared if we achieve our learner centered goals.

Objective 1: Students will be prepared to pursue advanced degrees in Biology.

Objective 2: Students will be prepared to pursue careers in biology-related private industry, such as the pharmaceutical industry, agricultural and food safety industry and environmental consulting.

Objective 3: Students will be prepared to pursue careers in biology-related government agencies, such as public health and environmental monitoring agencies.

Objective 4: Students will be prepared to pursue careers teaching Biology at the high school, junior college or community college level.

Measurement tools for learner centered objectives

For this assessment for FY 12-FY14 we used a multi-faceted approach to evaluating the efficacy of our MS program in meeting our learner centered objectives. First, we used results for our 'MS graduate student exit survey,' which asks for information about whether the student has been admitted for advanced study or been hired at the time that he/she graduates. Second, we surveyed faculty about the professional activities of recent graduates from their labs with whom they remain in touch. Third, we conducted on-line searches either to gather information about graduates' professional activities from professional networking sites (e.g. LinkedIn) or to contact the graduate. In addition, to evaluate thesis defenses and defenses of capstone projects, since the last round of assessment, we have started using a 'learner outcomes' rubric that is completed by Biology faculty on the thesis or capstone committee other than the student's advisor. This rubric indirectly evaluates our learner-centered objectives because it provides information on whether students have obtained the skills and behaviors in our MS program that are required to follow career paths identified in our objectives.

The table below maps learner outcomes onto the learner-centered objectives with which they are most closely associated. The learner outcomes are identified by numbers.

Learner outcomes

1. Students will be familiar with topical research questions and hypotheses in their field of biology.

2. Students will be able to interpret hypotheses, methods and results presented in primary scientific literature.

3. Students will be able to formulate testable research questions and hypotheses.

4. Students will be able to design and analyze experiments or observational studies that test research questions and hypotheses.

5. Students will acquire the ability to orally communicate scientific research in meeting-style presentations and in seminars.

6. Students will be able to communicate scientific research to other scientists in writing.

Objective	Learner Outcome
Pursue advanced degree in Biology	1,2,3,4,5,6
Careers in private industry	1,2,3,4,5,6
Careers in government agencies	1,2,3,4,5,6
Teaching Biology at high school, junior college, community college	1,2,3,4

Programmatic Goals

Goal 4: We will maintain a "critical mass" of graduate students to generate a dynamic, intellectually diverse Biology graduate student community.

Goal 5: Graduate faculty will maintain active, nationally recognized research programs.

Programmatic Objectives

Objective 1: Recruit and enroll so that there is an average of 1-2 graduate students being advised per graduate faculty member.

Objective 2: Graduate faculty will average 1 or more peer-reviewed publication per year.

Objective 3: Graduate faculty will average attendance at 1 or more national or international scientific meeting per year.

Measurement tools for programmatic objectives

For this report and in the future, we will use annual faculty activity reports to provide data to evaluate whether the programmatic objectives are being met.

2. Describe the quality of the program as assessed by the strengths, productivity, and qualifications of the faculty in terms of SCH, majors, graduates, and scholarly/creative activity (refer to instructions in the WSU Program Review document for more information on completing this section).

Scholarly Productivity	Number Journal Articles		Number Presentations		Number Conference Proceedings		Performances			Number of Exhibits		Creative Work		No. Books	No. Book Chaps	No. Grants Awarded or Submitted	$ Grant Value
	Ref	Non-Ref	Ref	Non-Ref	Ref	Non-Ref	*	**	***	Juried	****	Juried	Non-Juried				
Year 1	11	2	32												1	3(3 awarded)	$246,374
Year 2	18		23													18 (9 awarded)	$312568
Year 3	15	1	36													28 (6 awarded)*	$207816

* Winning by competitive audition. **Professional attainment (e.g., commercial recording). ***Principal role in a performance. ****Commissioned or included in a collection.

- Provide a brief assessment of the quality of the faculty/staff using the data from the table above and tables 1-7 from the Office of Planning Analysis as well as any additional relevant data. Programs should comment on details in regard to productivity of the faculty (i.e., some departments may have a few faculty producing the majority of the scholarship), efforts to recruit/retain faculty, departmental succession plans, course evaluation data, etc.

Provide assessment here:

During this assessment period (FY2012-2014) the Biology Department had 11 tenured or tenure-track graduate faculty and 12 tenured or tenure-track faculty who taught undergraduate courses. Data provided in the above table are drawn from faculty activity reports for 2012, 2013 and 2014. The standard mechanisms for disseminating research results in Biology are peer-reviewed journal articles and presentations at professional meetings. Therefore, the absences of books and conference proceedings published as well as performances and exhibits are to be expected.

During the evaluation period, the Biology Department exceeded our objective of maintaining an MS program with an average of 1-2 graduate students per graduate faculty member (programmatic objective #1). In both 2012 and 2013 (data for 2014 was not provided), the Biology graduate program included 26 students for an average of 2.36 students per graduate faculty. The graduate program also was productive in graduating MS students FY2012-FY2014, graduating 9, 9 and 8 students in 2012, 2013 and 2014, respectively.

The Biology Department faculty met the objective of producing at least one peer-reviewed publication per graduate faculty member per year (programmatic objective #2), producing 1.0, 1.64 and 1.36 peer-reviewed publications per graduate faculty member in 2012, 2013 and 2014, respectively. Publication effort is well distributed among the faculty as a different faculty member produced the largest number of publications in each of the three years of the evaluation period.

The Biology Department faculty came close to meeting the objective (programmatic objective #3) of attending at least one national or international professional meeting per year, making presentations at 1.0, 0.82 and 1.27 national or international meetings per graduate faculty member in 2012, 2013 and 2014, respectively.

The high quality of the research programs being maintained by faculty in the Biology Department is also illustrated by frequent requests for professional service and successful grantsmanship in a very tough environment for seeking external funding. For 2012-2014, biology faculty performed 86 peer-reviews of manuscripts for national and international journals and 5 faculty members served on editorial boards of international journals. An additional faculty member served as a guest editor for a 'special issues' edition of an international journal in his field of expertise. In terms of seeking external funding, Biology faculty were awarded >$766,000 in external grants during the evaluation period and continued to conduct research on grants that were awarded before FY 2012 and totaled >$6,880,000.

Dynamic faculty research program and faculty member's professional connections maintained through commitment to professional service have substantial benefits for the opportunities available to graduate students. During the evaluation period, graduate student were lead authors or co-authors on 14 of the 44 articles published by Biology faculty. Further, graduate students were lead presenter or co-authors on 13 presentations at national or international professional meetings. Additionally, success in having students who have graduated from the MS program admitted into PhD programs illustrates the point that other scientists consider our students to have received strong training. Of course not all MS students want to pursue further study, but during the evaluation period 26.8% of our graduate students were accepted into PhD programs in various fields of biology.

3. **Academic Program: Analyze the quality of the program as assessed by its curriculum and impact on students for each program (if more than one). Attach updated program assessment plan (s) as an appendix (refer to instructions in the WSU Program Review document for more information).**

a. For undergraduate programs, compare ACT scores of the majors with the University as a whole. Majors in biological sciences have an average ACT score of 24 compared to 23 of the whole student population. These numbers are consistent since 2007.

b. For graduate programs, compare graduate GPAs of the majors with University graduate GPAs.

During the evaluation period, the mean GPAs of students admitted to the Biology MS program is somewhat lower than the average for students admitted to graduate programs for the university as a whole (3.27 (Biology) vs. 3.5 (University)). Since FY 2008, GPAs of students admitted to the Biology MS program have been lower than students admitted for graduate study across the university, so the pattern for FY2012-2014 does not represent a change. However, there also may be a slight trend toward lower GPAs of students admitted to the Biology MS program than in previous years. For the 2009-2011 evaluation periods the mean GPA of admitted students were 3.37. During the evaluation period, several steps were initiated to help ensure that the strongest students in the applicant pool are being admitted, including an application deadline to allow comparison among all applicants to the program and an admission committee to obtain multiple perspectives on subjective components of the application, such as letters of recommendation and statements of purpose. These changes, however, only came into effect for spring 2015 admission, after this evaluation period.

c. Identify the principal learning outcomes (i.e., what skills does your Program expect students to graduate with). Provide aggregate data on how students are meeting those outcomes in the table below. Data should relate to the goals and objectives of the program as listed in 1e. Provide an analysis and evaluation of the data by learner outcome with proposed actions based on the results.

In the following table provide program level information. You may add an appendix to provide more explanation/details. Definitions:
Learning Outcomes: Learning outcomes are statements that describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire in their matriculation through the program (e.g., graduates will demonstrate advanced writing ability).
Assessment Tool: One or more tools to identify, collect, and prepare data to evaluate the achievement of learning outcomes (e.g., a writing project evaluated by a rubric).
Criterion/Target: Percentage of program students expected to achieve the desired outcome for demonstrating program effectiveness (e.g., 90% of the students will demonstrate satisfactory performance on a writing project).
Result: Actual achievement on each learning outcome measurement (e.g., 95%).
Analysis: Determines the extent to which learning outcomes are being achieved and leads to decisions and actions to improve the program. The analysis and evaluation should align with specific learning outcome and consider whether the measurement and/or criteria/target remain a valid indicator of the learning outcome as well as whether the learning outcomes need to be revised.

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Learning Outcomes (most programs will have multiple outcomes)	Assessment Tool (e.g., portfolios, rubrics, exams)	Target/Criteria (desired program level achievement)	Results	Analysis
1-Students will develop a broad knowledge of biological concepts.	Students are required to take the ETS Major Field Achievement Test in Biology prior to being certified for graduation	Average of all WSU graduates will be at or above the national mean.	WSUBiosci:National 1-155.85:153.3 SD = 13.2 2-155.5:153.1 SD = 13.3 3-152.4:153.2 SD =13.3	Although a slight decrease in WSU scores occurred in Year 3, this is still within the SD (standard error) and so our students continue to be at or above the mean for the overall score. See subset scores in table 3c below.
2 & 3-Students will develop the intellectual and mechanical skills necessary to conduct biological research. Students will participate in research and scholarly activity through interactions among students, faculty, and other professional biologists in the community.	Biol 497-Colloquium and Biol 499-Undergraduate Research	100% satisfactory grades	Biol 497/Biol 499 enrollment 1-32/41 2-43/54 3-47/54 All years at 100% satisfactory grades	1-3 meets target
Assessment of the program using department survey for graduating seniors.	Graduating senior department survey-attached in appendix	75% of graduating seniors will strongly or somewhat agree that they received a good education at WSU.	1-n=29, 86% 2-n=43, 93% 3-n=46, 65% (if agree answers included, then 89% favorable response	1, 2-Exceeds target 3-of the 11 students who agreed, only 3 left comments: limited course availability, classes hurt GPA, and would have picked a major with better job

				opportunities.

TABLE 3C. MFT EXAM WSU-BIOLOGICAL SCIENCES (WSU) COMPARED TO NATIONAL MFT EXAM RESULTS

WSU: Nat'l average	WSU:NAT'L Mean total	WSU:NAT'L Mean cell biology	WSU:NAT'L Mean molecular biology and genetics	WSU:NAT'L Mean organismal biology	WSU:NAT'L Mean population biology, evolution, and ecology
Year 1 n=18,270	155.85:153.3	55.5:53.2	54.13:53.1	56.5:53.4	54.7:52.7
Year 2 n=32,929	155.41:153.1	55.14:53.2	53.45:53.0	55.55:53.2	55.16:52.6
Year 3 n=45,174	152.4:153.2	51.61:53.2	52.73:53.0	53.07:53.20	51.68:52.7

MASTER OF SCIENCE GRADUATE PROGRAM Copies of the surveys that we use as assessment tools are submitted with this report. For the evaluation period, results for the learner outcomes rubric for MS defenses are based on 13 completed rubrics and results for the MS graduate student exit survey are based on 6 completed surveys. In part, these sample sizes are low because these assessment tools were first implemented after the FY2009-FY2011 assessment report had been approved, which was not until the beginning of FY 2013. Therefore, no data was collected on graduates during FY 2012. Nevertheless, a goal moving forward should be to develop strategies to increase response rates for both assessment tools.

Learning Outcomes (most programs will have multiple outcomes)	Assessment Tool (e.g., portfolios, rubrics, exams)	Target/Criteria (desired program level achievement)	Results	Analysis
Students will be familiar with topical research questions and hypotheses in their field of biology.	1. Learner outcomes rubric for MS defenses (completed by Biology faculty other than the advisor on the thesis / capstone committee) 2. MS graduate student exit survey (completed by graduating student)	1. average score of 3 or 4 2. majority of graduates indicating the highest level of comfort and confidence with the learning objective (outcome A on the survey.)	1. Mean = 3.77 2. 67% indicating highest level of comfort and confidence with learning objective	Please see analysis at end of table
Students will be able to interpret hypotheses, methods and results presented in primary scientific literature.	1. Learner outcomes rubric for MS defenses (completed by Biology faculty other than the advisor on the thesis / capstone committee) 2. MS graduate student exit survey (completed by	1. average score of 3 or 4 2. majority of graduates indicating the highest level of	1. Mean = 3.54 2. 100% indicating highest level of comfort and confidence with	Please see analysis at end of table

	graduating student)	comfort and confidence with the learning objective (outcome A on the survey.)	learning objective	
Students will be able to formulate testable research questions and hypotheses.	1. Learner outcomes rubric for MS defenses (completed by Biology faculty other than the advisor on the thesis / capstone committee)	1. average score of 3 or 4	1. Mean = 3.62	Please see analysis at end of table
Students will be able to design and analyze experiments or observational studies that test research questions and hypotheses.	1. Learner outcomes rubric for MS defenses (completed by Biology faculty other than the advisor on the thesis / capstone committee)	1. average score of 3 or 4	1. Mean = 3.58	Please see analysis at end of table
Students will acquire the ability to orally communicate scientific research in meeting-style presentations and in seminars.	1. Learner outcomes rubric for MS defenses (completed by Biology faculty other than the advisor on the thesis / capstone committee) 2. MS graduate student exit survey (completed by graduating student)	1. average score of 3 or 4 2. majority of graduates indicating the highest level of comfort and confidence with the learning objective (outcome A on the survey.)	1. Mean = 4 2. 67% indicating the highest level of comfort and confidence with learning objective	Please see analysis at end of table
Students will be able to communicate scientific research to other scientists in writing.	1. Learner outcomes rubric for MS defenses (completed by Biology faculty other than the advisor on the thesis / capstone committee) 2. MS graduate student exit survey (completed by graduating student)	1. average score of 3 or 4 2. majority of graduates indicating the highest level of comfort and confidence with the learning objective (outcome A on the survey.)	1. Mean = 3.77 2. 67% indicating highest level of comfort and confidence with learning objective	Please see analysis at end of table

The results from our assessment tools for our six learner outcomes fairly consistently show that both the Biology faculty and our graduates feel that the graduates are attaining a high level of competency in all of the learner

outcomes. It is noteworthy that when students did not feel the highest level of comfort and confidence in their attainment of a learning outcome, they always indicated a mid-level of comfort and confidence and never a low-level of comfort. The exit surveys also indicate that the students are being trained in the skills indicated by the learner outcomes in multiple ways. All respondents indicated that they were exposed to reading primary scientific literature both through coursework and interacting with their advisor. Similarly, all students indicated that they had exposure to preparing oral presentations both in their coursework and through interactions with their advisor. Students indicated less frequent exposure to doing scientific writing in courses. 33% of respondents indicated receiving instruction in scientific writing in their courses. All students indicated interactions with the advisor as the primary means of learning about writing in a scientific style. The robustness of these assessments will clearly be enhanced by a higher response rate for both the rubric and the exit survey and strategies for improving the response rates should be developed. Nevertheless, the general success of our graduates in being admitted to programs for advanced study and in finding employment suggests that they are graduating from the program with a competitive set of skills.

d. Provide aggregate data on student majors satisfaction (e.g., exit surveys), capstone results, licensing or certification examination results (if applicable), employer surveys or other such data that indicate student satisfaction with the program and whether students are learning the curriculum (for learner outcomes, data should relate to the outcomes of the program as listed in 3c).

UNDERGRADUATE PROGRAM

Learner Outcomes (e.g., capstone, licensing/certification exam pass-rates) by year, for the last three years				
Year	N	Name of Exam	Program Result	National Comparisons: University comparison to WSU and LAS graduates
1	30	WSU end of program exit survey	63.3% satisfied or very satisfied Median score 4/5*	16% below WSU and 11 % below LAS
2	56	WSU end of program exit survey	76.8% satisfied or very satisfied Median score 4/5	7% below WSU and same as LAS
3	55	WSU end of program exit survey	74.5% satisfied or very satisfied Median score 4/5	6% below WSU and same as LAS

MASTER OF SCIENCE GRADUATE PROGRAM

Results from the 'Application for degree exit survey' indicate a high level of satisfaction with the training that students receive in the Biology MS program. For FY2012-2014, the mean percentage of graduates describing themselves as satisfied or very satisfied with the Biology MS program was 78.2% and this percentage increased over the evaluation period from 69.2% in 2012 to 87.5% in 2014. The assessment results for our learner outcomes suggest that both from the perspectives of the faculty (Learner outcome rubric for MS defenses) and of our graduates (MS graduate student exit survey) students are succeeding in learning the skills and behaviors of scientists that we have identified as important for success. A comment that was made by multiple graduates on our 'MS graduate student exit survey' was the desire for more graduate-level molecular biology, cell biology and microbiology courses. The opportunity to hire additional tenure-track faculty in these areas would allow us to address these areas of need as expressed by our graduates.

e. Provide aggregate data on how the goals of the *WSU General Education Program* and *KBOR 2020 Foundation Skills* are assessed in undergraduate programs (optional for graduate programs).

Outcomes:	Results	
	Majors	Non-Majors
○ Have acquired knowledge in the arts, humanities, and natural and social sciences ○ Think critically and independently ○ Write and speak effectively ○ Employ analytical reasoning and problem solving techniques		

Note: Not all programs evaluate every goal/skill. Programs may choose to use assessment rubrics for this purpose. Sample forms available at: http://www.aacu.org/value/rubrics/

f. For programs/departments with concurrent enrollment courses (per KBOR policy), provide the assessment of such courses over the last three years (disaggregated by each year) that assures grading standards (e.g., papers,

portfolios, quizzes, labs, etc.) course management, instructional delivery, and content meet or exceed those in regular on-campus sections.

Provide information here: NA

g. Indicate whether the program is accredited by a specialty accrediting body including the next review date and concerns from the last review.

Provide information here: NA

h. Provide the process the department uses to assure assignment of credit hours (per WSU policy 2.18) to all courses has been reviewed over the last three years.

Provide information here: The departmental affairs committee regularly monitors course content by reviewing syllabi for courses on a rotating basis.

i. Provide a brief assessment of the overall quality of the academic program using the data from 3a – 3e and other information you may collect, including outstanding student work (e.g., outstanding scholarship, inductions into honor organizations, publications, special awards, academic scholarships, student recruitment and retention).

Provide assessment here:

UNDERGRADUATE PROGRAM: The program continues to produce graduates who are prepared to continue graduate studies or become employed. Based on data provided, our students have a slightly higher than average ACT score and perform at the national mean for the major field test when compared to the other 280 undergraduate programs administering the exam. Despite the low number of faculty and the staggered course rotation, most students continually agree they would repeat their undergraduate experience at WSU. In year 1, 2, and 3 approximately 10 students/year presented their research at the 12th, 13th, & 14th annual University Research and Creative Activity Forum (URCAF) and the 10th, 11th, & 12th annual Kansas IDEA Network for Biomedical Research Excellence KINBRE symposium. In year 1, biology students placed 2nd in oral presentations and posters. In year 2, biology students won first and second place for oral presentations. 18 students were funded by KINBRE awards over the three year period.

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The quality of the Biology MS program is high. Enrollment in the Biology MS program exceeds our goal of 1-2 graduate students per faculty member and the program is at capacity. A high proportion of students are graduating from the MS program within 2-2.5 years. Frequent authorship by MS graduate students on peer-reviewed publications and on presentations at national and international meetings demonstrates that they are involved in significant biological research. Further, our graduates' comments, our faculty's evaluations of theses and our graduates' success in finding employment or positions for advanced study all indicate that we are being fairly successful in meeting our objectives and learner outcomes.

4. Analyze the student need and employer demand for the program. Complete for each program if appropriate (refer to instructions in the WSU Program Review document for more information on completing this section).

UNDERGRADUATE PROGRAM

a. Data compares under-represented minorities (URM) who are classified as freshman/sophomores and juniors/seniors at the university, college of Liberal Arts and Sciences and biological sciences program. An average from the past 5 years indicates that 56.3% of all applicants to our program actually enroll. Of the admitted students during these years, about 14% are URM freshmen/sophomores and about 12% continue to their junior/senior year. This is 3.2% below the admittance rate of the university, but the rate is equivalent in Liberal Arts and Sciences for both freshmen/sophomores, and juniors/ seniors. The rate is consistent for graduation rates, where the degrees conferred are 8.9 % for URM, equivalent to LAS, and 3.4% below the university rate.

MASTER OF SCIENCE GRADUATE PROGRAM

The most apparent trend in the data related to applications, admissions and enrollment for the period FY2012-2014 has been the large increase in the number of applications. Applications in FY 2013 (38) and FY 2014 (48) far exceeded the number of applications received in any year during the FY 2009-FY 2011 evaluation period when the maximum number of applications in a year was 24. Particularly in FY2014, the large increase in applicants resulted from an increase in international applications. In FY2014, 64% of applicants were international whereas between FY2009 and FY 2013 the percentage of international applications varied between 28% and 48%. With an increase in the number of applicants, but no increase in the number of faculty to mentor graduate student theses, the admission rate was lower in 2014 (48%) than in any previous year for which data was available. The proportion of admitted students who enroll (FY 2012-2014 mean = 72%) appears to have remained steady to increased slightly from previous evaluation periods (FY 2009-2011 mean = 60%).

Interestingly, this larger applicant pool has not translated into higher GPA among the admitted students (see section 3b). This might suggest that while the over-all applicant pool is larger, the pool of well-qualified applicants has not increased. Alternately, we may not have had procedures in place during the evaluation period to adequately identify the most qualified applicants from this larger pool. Starting with fall 2014, we implemented fall and spring application deadlines to allow us to compare qualifications among all applicants for the upcoming semester and we have established an admission committee to provide multiple perspectives on subjective components of the application materials, such as letters of recommendation and the statement of purpose.

Under-represented minorities are a small proportion of the students engaged in graduate education in Biology (mean = 5.75% for FY2012 and FY 2013 (FY2014 data not provided)) and this percentage is slightly less than for Masters programs across the College of Liberal Arts and Sciences (6.45%) and for Masters programs across the University as a whole (10.5%) during the same interval. The percentage of Biology graduate students belonging to under-represented minorities has not changed since the FY2009-FY2011 evaluation period (mean = 5.35%). Domestic students belonging to under-represented minorities are a small proportion of the applicant pool to the Biology MS program. For FY2012-FY2014, such students constituted 7.2% of applicants. The mean percentage of graduates from the Biology MS program in FY2012 and FY 2013 that belonged to under-represented minorities was 5.6%, consistent with representation in the MS program.

b. Utilize the table below to provide data that demonstrates student need and demand for the program.

UNDERGRADUATE PROGRAM

Employment of Majors*							
	Average Salary	Employ-ment % In state	Employment % in the field	Employment: % related to the field	Employment: % outside the field	No. pursuing graduate or profes-sional educa-tion	Projected growth from BLS** Current year only.
Year 1 n=3	$32,600	50%	0	50%	50%	1 (MD)	
Year 2 n=9	$33,300	33.3%	66%	33%	0	4 (MD, MS, PharmD, OT)	
Year 3 n=10	$24,700	100%	0	60%	40%	5 (MD, DDS, 3 MS)	10%-as fast as average for 2015 biological technician

* May not be collected every year

** Go to the U.S. Bureau of Labor Statistics Website: http://www.bls.gov/oco/ and view job outlook data and salary information (if the Program has information available from professional associations or alumni surveys, enter that data)

- Provide a brief assessment of student need and demand using the data from tables 11-15 from the Office of Planning and Analysis and from the table above. Include the most common types of positions, in terms of employment graduates can expect to find.

UNDERGRADUATE PROGRAM: As an urban university in the largest city in Kansas, we allow traditional and non-traditional students the opportunity to pursue a bachelor's degree. Freshmen/sophomore compromise about 40% and juniors/seniors are 60% of the total enrolled students for AY '12 and '13 (n=400).
The average graduation rate is 52 students/year. Based on student survey response data above, 50% of our students attend professional schools upon graduation. Employment in the field of biological sciences is down 4% since the last evaluation per BLS website, but in spite of this, our students continue to be employed in the field or in a related field.

Graduates can expect to find employment, especially if they are willing to move to nearby states. Of the students employed out of state, most are in neighboring states. Most employed students were in the field of biological research or health-related professions; such as pharmacy or optometry technicians. These data show our program is in demand.

MASTER OF SCIENCE GRADUATE PROGRAM

We were able to obtain information on the current professional activities of 21 of the 26 graduates from the Biology MS program for FY2012-FY2014. This information is summarized in the table below.

Employment of Majors*							
	Average Salary	Employ-ment % In state	Employment % in the field	Employment: % related to the field	Employment: % outside the field	No. pursuing graduate or profes-sional educa-tion	Projected growth from BLS** Current year only.
Year 1	36217	4/7	4/5	1/5	0	2	
Year 2	29730	3/7	5/5	0	0	2	
Year 3	33313	5/7	4/5	1/5	0	2	

* May not be collected every year

** Go to the U.S. Bureau of Labor Statistics Website: http://www.bls.gov/oco/ and view job outlook data and salary information (if the Program has information available from professional associations or alumni surveys, enter that data)

- Provide a brief assessment of student need and demand using the data from tables 11-15 from the Office of Planning and Analysis and from the table above. Include the most common types of positions, in terms of employment graduates can expect to find.

Provide assessment here:

MASTER OF SCIENCE GRADUATE PROGRAM

Our four learner-centered objectives focus upon the types of professional activities for which we seek to prepare our MS students. Specifically, we seek to educate our students in the skills needed to pursue more advanced degrees in Biology, be employed in biology-related industry, be employed in biology-related positions with government agencies and be employed in education positions related to biology. Among the students who graduated from our MS program during the evaluation period and for whom we were able to determine current activities, 28.6% (6/21) are pursuing advanced degrees in Biology. Five of the students are in PhD programs, ranging from plant genetics to entomology to natural resource management, and one is in Pharmacy School. Two more graduates are technicians in university labs. 23.8% (5/21) of graduates are in technician positions in industry. Industries employing these students include pharmaceuticals and agricultural technology. Two more graduates are employed in environmental regulatory positions in industry. 4.8% (1/21) of graduates are in government agencies. This graduate is an entomologist with the Oregon Department of Agriculture. 23.8% (5/21) of graduates are in temporary or permanent teaching positions at community colleges, junior colleges or WSU. Over-all, it seems like graduates from the Biology MS program are having success in finding positions for advanced study, in industry, in government agencies and in education. Therefore, we believe that the training that we are providing in the MS program is preparing our students well to meet the expectations of PhD and professional programs and the needs of employers.

It is worth noting that 20 of the 21 graduates for whom we have data graduated from the thesis-track of the Biology MS program. The thesis track provides intensive mentoring of the student by his/her faculty advisor in the process of conducting original research. The activities of our graduates during the evaluation period suggest that this kind of training is very appealing to employers, PhD programs and professional programs. However, it requires substantial investment in faculty time and resources. This is why we maintain the goal of 1-2 graduate students per graduate faculty member. The intensive nature of this research training places a limit on the number of students who can be mentored unless there is an increase in the number of faculty an in funding for assistantships.

5. **Analyze the service the Program provides to the discipline, other programs at the University, and beyond. Complete for each program if appropriate (refer to instructions in the WSU Program Review document for more information on completing this section).**

a. Provide a brief assessment of the service the Program provides. Comment on percentage of SCH taken by majors and non-majors, nature of Program in terms of the service it provides to other University programs, faculty service to the institution, and beyond.

Provide assessment here:

UNDERGRADUATE PROGRAM: The SCH for majors is about 26%, which is a 6.5% increase since the last review. The average for non-majors courses is about 71% representing an 8% decrease in non-major SCH. We have seen a decrease in our Biol 223-Human Anatomy & Physiology for non-majors after the addition of HS 290-Foundations of Human Anatomy & Physiology. Since many courses in the program have laboratory sections, we have been working on new ways to enhance our online presence for non-majors. As of fall '15, we have increased our online courses by 100% and currently are developing Biol 107-human biology laboratory for non-majors as an online course. In order to provide continued high quality laboratory experiences, we have been careful in developing this online laboratory course, but feel the additional time spent will be of great benefit to our students as well as assessing our ability to provide other non-majors courses with lab online.

MASTER OF SCIENCE GRADUATE PROGRAM

During the evaluation period, 70-80% of the credit hours produced by the Biology department were attributable to non-program majors. Therefore, the courses taught in the Biology department clearly are of demand by students in other programs on campus and the Biology department provides a very substantial service to other programs on campus. Graduate students in the Biology MS program play an essential role in making these courses that other majors on campus enroll in possible because the graduate students instruct lab sections for many of our highest enrollment courses including Human Organism (Bio 106, lab Bio 107), General Biology I (Bio 210) and General Biology II (Bio 211).

Mentoring MS graduate students represents a nexus of the research and teaching functions of our department. Graduate students are important to research success through their contribution to faculty research projects as graduate research assistants and through conducting their thesis research. During this evaluation period, MS graduate students participated in research funded by external grants to Biology Department faculty that totaled > $7.6 million. These external funding sources were diverse, including National Institutes of Health, National Science Foundation, United States Department of Agriculture, Flossie E. West Memorial Foundation, and Kansas Soybean Council. To be clear, some of these grants were awarded before FY 2012 but the funded projects supported the research efforts of MS graduate students and provided indirect costs to the university during the evaluation period.

Graduate students in our MS program and graduate faculty are extensively involved in outreach activities in the Wichita community. Graduate students regularly participate as judges in activities such as Science Olympiad and Kansas Junior Academy of Science annual meeting. Graduate students and faculty are also involved in presentations in high school science classes and departmental tours for high school students. During the evaluation periods, graduate faculty and students served as a resource for the public, media and state agencies for identification of organisms. Graduate students and faculty have also been involved in preparation of an exhibit on insect diversity in collaboration with Exploration Place.

6. Report on the Program's goal (s) from the last review. List the goal (s), data that may have been collected to support the goal, and the outcome. Complete for each program if appropriate (refer to instructions in the WSU Program Review document for more information on completing this section).

UNDERGRADUATE PROGRAM

(For Last 3 FYs)	Goal (s)	Assessment Data Analyzed	Outcome
	Refill the Assistant to Chair/Undergraduate Advisor position, vacant since June 2010)	NA	Ms. Maria Martino was promoted to this position as of September 2012. Reviews about advising from exit surveys are very favorable.
	Appoint co-op coordinator to expand co-op opportunities	NA	Dr. David McDonald appointed as co-op coordinator as of Fall 2013.
	Enhance senior survey to better reflect goals and learner outcome assessments	Program graduating senior survey (attached)	The survey will be updated again to include information about employment searches outside of the Wichita metropolitan area. Many non-traditional students need to remain in the Wichita area and maybe affecting the students ability to gain employment.
	MFT results broken into 4 subsets	MFT provided data for 4 subsets	SEE TABLE 3C FOR COMPARISONS
	Revise departmental affairs committee (DAC) so every faculty member will serve.		As of spring 2012 DAC now includes a rotation so every faculty member serves once every 3 years and members overlap for continuity
	Use new university exit and alumni survey data	Data provided by WSU Institutional Research	Included in this assessment.

7. Summary and Recommendations

a. Set forth a summary of the report including an overview evaluating the strengths and concerns. List recommendations for improvement of each Program (for departments with multiple programs) that have resulted from this report (relate recommendations back to information provided in any of the categories and to the goals and objectives of the program as listed in 1e). Identify three year goal (s) for the Program to be accomplished in time for the next review.

Provide assessment here:

UNDERGRADUATE PROGRAM

- Strengths: Faculty, especially research active faculty, has world class expertise in their fields that is shared with students.
- Faculty, staff, and graduate students provide significant community outreach.
- Upper division labs taught by faculty
- Diverse course offering especially given the small size of our faculty

Weaknesses:

- All core classes are not taught every semester due to the extensive teaching loads plus research commitments of existing faculty.
- Minimal courses taught online.
- Additional space and possible remodeling is needed for teaching labs and office space for lecturers and emeritus faculty.
- Old and outmoded equipment in some teaching labs.

THREE-YEAR GOALS TO BE ACCOMPLISHED BY NEXT REVIEW

1. Improve their online presence for non-majors courses with or without labs with the development of existing and new courses.
2. Move forward with the proposal to renovate/remodel existing teaching facilities to accommodate more students each semester.

MASTER OF SCIENCE GRADUATE PROGRAM

Performance in comparison to past objectives

In section 2 we have provided evaluation of the MS programs general success in meeting our programmatic objectives for program size, faculty productivity and faculty engagement in their professional communities. In section 3c we provided data and evaluation from our two learning outcomes assessment tools (Rubric for MS thesis defenses, MS graduate student exit survey) that suggest that from both faculty and student perspectives we are generally successful in achieving our desired learning outcomes. Here we revisit the four goals stated in the summary portion of our FY2009-FY2011 program review.

Goals from FY2009-FY2011 evaluation

1. Maintain an active MS graduate program that consistently includes >20 MS students.

For FY2012-FY2014, the number of students in the Biology MS program was consistently 26 or greater.

2. Graduate a minimum of 5 students from our MS program per year.

For FY2012-FY2014, we graduated 9, 9 and 8 students.

3. For the biomedical component of our MS graduate program, expand our research collaborations, including graduate student research, with CIBOR (Center for Innovation for Biomaterials and Orthopedic Research) and KU Medical School to further exploit these opportunities for clinical research.

Our biomedical faculty were extensively involved with CIBOR and the Wichita medical community, including the KU Medical School, during the evaluation period. The Biology Department provides laboratory space on a courtesy basis to two CIBOR scientists, Dr. Paul Wooley and Dr. Shang-You Yang. One of the graduates from our MS program during the evaluation period was mentored by Dr. Wooley and a second MS student, who graduated after the evaluation period, conducted research in Dr. Yang's lab. Biomedical faculty received funding through the Kansas Idea Network of Biomedical Research Excellence (KINBRE)'s 'Partnerships for Translational Research Training' program that provided support for MS students whose research had clear clinical application. This program also required that the research involve physicians outside academia to promote the clinical and translational direction of the research. Finally, Biology faculty were involved in collaborations that benefitted graduate education with Mechanical Engineering and Bioengineering faculty. These collaborations involved students from other departments having the opportunity to receive mentoring and use lab space in the Biology department to promote graduate research projects with clinical application.

4. For the ecology/evolution/organismal component of our MS program, begin faculty/graduate student research use and research productivity from our two relatively new natural areas, the Gerber and Sellers Reserves, and maintain rates of research productivity from our established Ninnescah Reserve.

The WSU Biological Field Station was an integral resource to the Biology MS program during the evaluation period. During this interval, three MS theses were conducted and completed at the WSU Biological Field Station. Four papers were published in international, peer-reviewed scientific journals by graduate faculty based upon data collected at the field station sites. The field station sites were used in five courses in which our graduate students enroll (Avian Biology, Taxonomy and Geography of Flowering Plants, Ecosystem Restoration and Management, Field Ecology and Conservation Biology). Although use of the Gerber and Sellers Reserves for courses and undergraduate research expanded during the evaluation period, graduate student and faculty research use continues to focus upon the Ninnescah Reserve. Therefore, during the upcoming evaluation period we retain this goal of expanding faculty/graduate student research use of the Gerber and Sellers Reserves.

Resources

During the evaluation period, the Biology MS program has consistently been at capacity as determined by faculty numbers and student funding. For the Biology MS program to grow further yet still maintain its focus on intensive training in conducting original scientific research, which appears to appeal to PhD programs, professional programs and employers, both funding in the form of graduate teaching or research assistantships and faculty numbers will need to increase.

Graduate teaching assistantships are a critical resource for maintaining a dynamic MS program when federal funding, which could support graduate research assistantships, is scarce. We are grateful for such funding that allows us to maintain a graduate program that averages 2-3 MS students per graduate faculty member and that provides crucial support for our undergraduate laboratory teaching. Our ability to teach these labs supports our program, but also has far-reaching effects for the education provided by the university as a whole because we provide courses needed by majors of many other departments. Further, if we are to enroll qualified international applicants, which toward the end of the evaluation period came to constitute a larger proportion of the applicant pool, non-instructional funding opportunities must also increase because these students often require funding and do not have the English proficiency or the experience in the U.S. educational system to work as teaching assistants in their first semester.

Human resources are also essential to a vibrant graduate program. For the biomedical component of our graduate program, collaborations with CIBOR (Center for Innovation in Biomedical and Orthopedic Research) and KU Medical School have provided research opportunities for both graduate and faculty research. However, adequate faculty numbers are critical to maintaining faculty productivity as well as a large, intellectually engaged graduate student community. The number of tenured or tenure-track faculty in Biology at WSU is the least among our peer institutions and in most cases approximately 50% of the size of the tenured or tenure-track faculty at peer institutions.

Peer Institution	Number of Tenured or Tenure-track Faculty Members in Biology Department
New Mexico State University	23
University of Massachusetts-Lowell	14
University of Nevada-Reno	23
University of North Dakota	20
Wright State University	24

With departmental, college, university and professional service demands being divided among a small number of faculty, inevitably time for graduate student mentoring and scholarship is challenged. In addition, adequate numbers of staff in a department are essential to meeting the needs of a graduate program that has expanded during the evaluation period. Therefore, increases in program size of both students and, hopefully, faculty would also require increased staff positions.

Goals for FY2015-FY2017

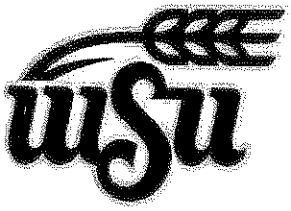
1. Maintain an active MS graduate program that consistently includes > 20 students.

2. Graduate a minimum of 5 students from our MS program per year.

3. Increase recruitment efforts targeted at undergraduate institutions in Kansas, perhaps with particular emphasis on under-represented minorities, to help ensure an applicant pool that is balanced with respect to international and domestic students and to ensure that top biology undergraduates consider the Biology MS program at WSU.

4. Develop strategies for increased participation in assessment tools, specifically 'MS graduate student exit survey.'

5. For the ecology/evolution/organismal component of our MS program, begin faculty/graduate student research use and research productivity from our two relatively new natural areas, the Gerber and Sellers Reserves, and maintain rates of research productivity from our established Ninnescah Reserve.



WICHITA STATE UNIVERSITY

FAIRMOUNT COLLEGE OF LIBERAL ARTS AND SCIENCES

Department of Biological Sciences

UNDERGRADUATE PROGRAM

316-978-3111

wichita.edu/biology

DEPARTMENT OF BIOLOGICAL SCIENCES
Fairmount College of Liberal Arts and Sciences
Wichita State University

UNDERGRADUATE DEGREE OPTIONS
For Students Entering Fall 2002 or Later

Bachelor of Sciences (BS) or Bachelor of Arts (BA) with Biological/Biomedical Emphasis

A traditional natural science degree which prepares students for a broad range of careers in general biology or the biomedical field. For both the BS and BA, students complete the University and College general education requirements. For the BS, students complete 40 hours of major level biology courses (including 13-15 hours of electives), 20 hours of chemistry and 10 hours of physics. For the Bachelor of Arts, students complete 30 hours of major level biology courses (including 3-5 hours of electives) and 20 hours of chemistry. The elective hours in biology give students the opportunity to focus in cell and molecular biology or add to their traditional biology curriculum. Degree requirements may be tailored to include pre-professional requirements, such as those for medicine and physical therapy.

Bachelor of Sciences or Bachelor of Arts with Ecological/Environmental/Organismal Emphasis

A natural science degree emphasizing courses in ecology, environmental science and organismal biology. For both the BS and BA, students complete the University and College general education requirements. For the BS, students complete 50 hours of major level biology courses (including 20 hours of courses relating to the area of emphasis), 15 hours of chemistry and 5 hours of physics. For the Bachelor of Arts, students complete 35 hours of major level biology courses (including 10 hours of courses relating to the area of emphasis) and 15 hours of chemistry. Degree requirements may be tailored to include the requirements for advanced degrees in the emphasis area, such as environmental science.

Field Major in Biochemistry

An interdisciplinary program jointly administered by the departments of chemistry and biology. Students complete the University and College general education requirements for the Bachelor of Science and a rigorous set of courses in biology, chemistry, physics and mathematics (including 21 hours of electives selected in consultation with an advisor). This major is particularly suitable for students with an interest in cell and molecular biology. Many students who intend to continue their education in biochemistry or professional schools find this to be a good option.

Bachelor of General Studies with Biological Sciences as the Primary Department

This degree program allows students to design their own program across disciplinary lines. Students must complete the University and College general education requirements for the Bachelor of General Studies and develop a plan of study, with an academic advisor, which includes 15 – 21 hours from the primary department (biology, in this case) and 6 – 9 hours from each of two additional departments. These 33 hours must include at least 12 hours of courses numbered 300 or higher. This highly flexible degree program is frequently used by returning adults to complete a degree in a more timely fashion than would be possible for more traditional degree programs. It may also be used by students seeking a broad educational experience or to complete pre-professional requirements which cross disciplinary boundaries.

Bachelor of Arts Field Major with Biological Sciences as Major Area

This is another interdisciplinary program which allows students to help design their own degree. Students must complete the University and College general education requirements for the Bachelor of Arts degree and develop a plan of study with an advisor, which includes at least 18 hours from the major area and nine hours from each of two related areas. These 36 hours must include at least 12 hours of upper division courses. This program is intended for students seeking a broad liberal arts education with an emphasis in biology.

For Further Information Contact

William J. Hendry III, Chair
Department of Biological Sciences
Wichita State University
Wichita, KS 67260-0026
316-978-3111
wichita.edu/biology

What Can You Do with a Biology Degree?

Plant Propagator Ornithologist Cooperative Extension Service Worker
Ethologist Game Manager Marine Engineer Water Engineer *Acarologist*
Parasitologist Industrial Hygienist Consultant Apiarist Surgeon Embryologist Microscopist *Allergist*
Entomologist Animal Breeder Technician
Ichthyologist Chiropractor Aquaculturist **Physical Therapist** Social Ecologist Nurse Anesthetist Geneticist *Tree Surgeon*
Wood Technologist Chemotaxonomist Nutritionist Crime Lab *Park Naturalist* Science Writer Morphologist Park Technician Materials Engineer Electron Microscope Technician
Paleoecologist *Forest Pathologist* ***Mammalogist*** Mid-wife **Agricultural** Natural Resources Manager Algologist Laboratory Immunologist
Arboriculturist Virologist Cytopathologist **Palynologist** Technician **Economist** **Biological** Zoologist Aquarium Director *Immunologist*
Clinical Technician Data Collector *Brewmaster* **Quality Assurance** Manager Sales Representative Anatomist Waste Disposal Engineer Landscape Architect
Sociobiologist Marine Life Technician Meat and Poultry Park Ranger Medical Records Librarian
Statistician Audiologist Optician Technician Economic Botanist **Forester** Food Inspector Osteopath *Manager of Quality Assurance & Shipping* Opthamalogist Medical Writer
Biological Consultant Agronomist ***Veterinary Hospital Assistant*** **Food & Drug Inspector**
Plant Biochemist *Cytogeneticist* *Veterinarian* Biochemist Bacteriologist
Genetic Counselor **Physician's Assistant** Dairy Manager Anesthetist Produce Clerk Animal Husbandry Technician **Aquatic Ecologist** Biologist *Taxonomist* Animal Behaviorist
Viticulturist Crab Mariculturist **Mortician** *Foreman in Radiochemistry* Laboratory Manager *Herpetologist*
Research Technician Shepherd
Taxidermist **Biostatistician** Emergency Medical Technician Histologist R & D Biochemist
Farm Manager
Physician
Cell Physiologist Forensic Pathologist Sewage Plant Operator
Weed Scientist *Mycologist* Biological Photographer **Park and Golf Course Superintendent**
Occupational Therapist
Communication Media Specialist—Radio-TV
Aviation Pathologist Medical Technologist Museum Technician—Curator **Nuclear Medicine Technologist**
Radiologist Forest Products Technologist *Zoo Director*
Staff Research Associate Editor
Population Geneticist Histologic Technician Marine Biologist *Archeologist*
Fossil Fuel Extractor Horticulturist **Pest Control Specialist** Biotechnologist
Dental Hygienist **Medical Illustrator** Dietitian Environmental Physiologist **Director of Management Engineering** *Food Technologist*
Animal Pathologist Sanitarian
Vegetable Scientist **Botanist** **Fisheries Biologist** ***Microbiologist*** Plant Quarantine Inspector
Cell Culture Operator **Optometrist** Process Engineer Trainee Zoo Assistant
Biophysicist **Oral Surgeon** *Public Relations* Respiratory Therapist *Peace Corps* Paramedic Medical Record Administrator Pharmacologist Radiobiologist
Cell Biologist Plant Pest Control Inspector **Industrial Waste Specialist** **Science Librarian** Field Ecologist **Rancher** Medical Assistant
Phlebotomist Anesthesiologist **Naturalist** *Representative* Teacher **Conservation Warden/Ranger**
Soil Scientist ***Forestry Technician***
Radiologic Technologist Recreation Manager Mushroom Farm Worker Licensed Practical Nurse **Meteorologist** ***Resource Policy Analyst***
Wildlife Conservation and Management Specialist **Developmental Biologist** Research Institute Librarian Environmentalist
Medical Entomologist Biological Engineer Hospital Administrator **Nurse** Research Associate **Pharmacist** *Food Processing Manager* **Range Manager**
Supply House Purchaser Greenhouse Manager ***Dental Assistant*** Insect Quarantine Inspector
Natural Sciences Research Curator **Phytopathologist** **Forest Economist** Environmental Planner *Endocrinologist* **Water Quality Controller** **Limnologist**
Assistant U.S. Forest Ranger Chemical Technician
Dentist Biological Illustrator **Aquatic Biologist**

Field Biologist **Office Manager for Family Dentistry** Floral Designer **Ecologist** **Medical X-ray Technician** **Toxicologist** Certified Laboratory Assistant Anthropologist **Fish Culturist** **Pathologist** Bioanalyst Nursery Owner Home Economist Poultry Scientist **Laboratory Technician** **Museum Educational Staff Member** Chicken Farmer Pediatrician ***Animal Nutritionist***

The above list of occupations was compiled by Scott, Foresman's Marketing Department, with the much-appreciated contributions of the following people:
Alice Fisher, Biology Department, The University of Texas at Austin; **David Cotter**, Chairman, Biological and Environmental Sciences Division, Georgia College; **Charles McMullen**, Department Head, Biology Department, South Dakota State University; **Lawrence Koehler**, Chair, Biology Department, and his colleagues, Central Michigan University; **Warren Furumoto**, Chair, Department of Biology, California State University, Northridge; **Edward L. Schneider**; Chairman, Biology Department, Southwest Texas State University; **Roger E. Thibault**, Department of Biological Sciences, Bowling Green State University; **Gerry Owen Montgomery**, Advising Technician, Biological Sciences Department, Cal Poly; **F. Maturo**, Undergraduate Coordinator, Department of Zoology, The University of Florida; **Terry Harrison**, Department Head, Biology Department, Central State University; **Don Tarter**, Department Head, Biology Department, Marshall University; and **Jay M. Savage**, Chairman, Biology Department, University of Miami.

While the above career list is certainly not exhaustive, we have tried to illustrate the breadth of career opportunities available in the Biological Sciences. Positions listed include those held by graduates of the preceding institutions; possible positions for which undergraduate and advanced training in biology or related disciplines might serve as a basis; and professional training for which degrees in biology are appropriate.

Additional copies of this poster may be obtained by contacting your local Scott, Foresman representative or by writing Meredith Hellestrae, Dept. LA-BIO, 1900 East Lake Avenue, Glenview, Illinois 60025.

Biomedical Engineer Technician *Extension Agent (Farm Advisor)* Watershed Manager Plant Manager **Cytotechnologist** Biometrician **Podiatrist** Registered Medical Technologist Environmental Impact Analyst **Nature Center Director** Plant Breeder **Protozoologist** ***Nematologist*** Pet Show Owner **Paleontologist** Physiologist **Forensic Service Technician** **Plant Physiologist**

Wichita State University – Fairmount College of Liberal Arts and Sciences
Department of Biological Sciences www.wichita.edu/biology

BIOLOGICAL SCIENCES—DEGREE CHECKSHEET—all degrees listed

At least 124 hours are required for graduation, and **students must earn a 2.0 overall GPA, a 2.0 WSU GPA, and a 2.0 GPA in the major.** Students must also complete all courses required for Liberal Arts and Sciences General Education.

Core Biology Courses (7 courses)

- 210 General Biology I (4) – FL & SP
- 211 General Biology II (4) – FL & SP
- 418 General Ecology (4) - FL
- 419 Genetics (4) - FL
- 420 Molecular Cell Biology (4) – SP
- 497 Biology Colloquium (1)-FL & SP **OR** BIOL 499 Undergraduate Research (2) – FL, SP, SU

One course from the following:

- 330 General Microbiology (5) - FL
- 502 Vascular Plants (4) - SP
- 503 Taxonomy & Geography of Flowering Plants (4) - SU
- 523 Freshwater Invertebrates (4)
- 524 Vertebrate Zoology (3)
- 528 Parasitology (4)

AND

- Major Field Test in Biological Sciences must be completed the semester you graduate. .

Check the circle to choose your degree and concentration and requirements for additional requirements.

○	○	○	○
BS-BIOLOGY/BIOMED (A12A)	**BS-ECO/ENVIRO/ORGAN** (A12A)	**BA-BIOLOGY/BIOMED** (A12B)	**BA-ECO/ENVIOR/ORGAN** (A12B)
+ additional biology major level electives for a total of 40 credit hours	+ 15 hours of approved EEO electives* AND + additional major level electives for a total of 50 credit hours	+ additional biology major level electives for a total of 30 credit hours	+ 5 hours of approved EEO electives AND + additional major level electives for a total of 35 credit hours
AND	AND	AND	AND
- 211-General Chemistry (5)	-Chem 211-General Chemistry (5)	-Chem 211-General Chemistry (5)	-Chem 211-General Chemistry (5)
-Chem 212-General & Inorganic Chemistry (5)	-Chem 212-General & Inorganic Chemistry (5)	-Chem 212-General & Inorganic Chemistry (5)	-Chem 212-General & Inorganic Chemistry (5)
-Chem 531-Organic Chemistry I (5)	-Chem 531-Organic Chemistry I (5)	-Chem 531-Organic Chemistry I (5)	-Chem 531-Organic Chemistry I (5)
-Chem 532-Organic Chemistry II (5)		-Chem 532-Organic Chemistry II (5)	
-Phys 213-General College Physics I (5)	-Phys 213-General College Physics I (5)		
-Phys 214-General College Physics II (5)			
TOTAL HOURS = 70	**TOTAL HOURS = 70**	**TOTAL HOURS =50**	**TOTAL HOURS = 50**
		AND FOREIGN LANGUAGE REQUIREMENT	AND FOREIGN LANGUAGE REQUIREMENT

Wichita State University – Fairmount College of Liberal Arts and Sciences
Department of Biological Sciences www.wichita.edu/biology

APPROVED EEO ELECTIVES

330	General Microbiology (5)
570	Conservation Biology (3)
502	Vascular Plants (4)
503	Taxonomy & Geography of Flowering Plants (4)
523	Freshwater Invertebrates (4)
524	Vertebrate Zoology (3)
527	Comparative Anatomy (5)
528	Parasitology (4)
530	Applied and Environmental Microbiology (3) - SP
532	Entomology (4)
540	Developmental Biology (4)
560	Plant Ecology (2)
561	Plant Ecology Lab (2)
573	Statistical Applications in Biology (3)
575	Field Ecology (3)
578	Aquatic Ecology (4)
595	Avian Biology (3)
630	Behavioral Ecology (3)
737	Aquatic Toxicology (3)
610/640	Topics in Botany/Zoology (3-4)

COURSE ROTATION FOR ALL BIOLOGY MAJOR LEVEL COURSES-AS OF 12/2013-SUBJECT TO CHANGE WITHOUT NOTICE

Fall even years		Spring odd years		Fall odd years		Spring even years		Summer-all years	
Course (credits)	Title	Course (credits)	Title	Course (credits)	Title	Course (credits)	Title	Course (credits)	Title
Biol 210 (4)	Gen Bio I	Biol 210 (4)	Gen Bio I	Biol 210 (4)	Gen Bio I	Biol 210 (4)	Gen Bio I	Biol 503 (4)	Geo and Taxonomy
Biol 211 (4)	Gen Bio II	Biol 211 (4)	Gen Bio II	Biol 211 (4)	Gen Bio II	Biol 211 (4)	Gen Bio II		of Flowering Plants
Biol 330 (5)	General Micro	Biol 420 (4)	Molec Cell	Biol 330 (5)	Gen Micro	Biol 420 (4)	Molec Cell	Biol 575 (3)	Field Ecology
Biol 418 (4)	Ecology	Biol 497/797 (1)	Colloquium	Biol 418 (4)	Ecology	Biol 497/797 (1)	Colloquium		
Biol 419 (4)	Genetics	Biol 528 (4)	Parasitology	Biol 419 (4)	Genetics	Biol 523 (4)	Fresh Water Inverts		
Biol 497/797 (1)	Colloquium	Biol 530 (3)	App/Env Micro	Biol 497/797 (1)	Colloquium	Biol 534 (3)	Human Physiology		
Biol 502 (4)	Vascular Plants	Biol 534 (3)	Hum Physio	Biol 532 (4)	Entomology	Biol 535 (2)	Human Phys Lab		
Biol 527 (5)	Comp Anat	Biol 535 (2)	Hum Phys Lab	Biol 524 (3)	Veterbrate Zoology	Biol 570 (3)	Cons Biol		
Biol 540 (4)	Developmental Biol	Biol 590 (3)	Immunology	Biol 560 (2)	Plant Ecology	Biol 590 (3)	Immunology		
Biol 573 (3)	Biostats	Biol 610G (3)	Ecol. Mgmt Restoration	Biol 561 (2)	Plant Ecology Lab	Biol 595 (3)	Avian Bio		
Biol 578 (4)	Aquatic Ecology	Biol 626 (3)	Reproductive Biology	Biol 640F (4)	Stream Ecology	Biol 640P (3)	Evolution		
Biol 710 (3)	Glycobiology	Biol 630 (3) TENT	Behavioral Ecology	Biol 640G (3)	Neurobiology	Biol 660G (3)	Pathogenic Micro		
Biol 740B (3)	Biodiversity, Phylogeny	Biol 738 (3)	Plant/Animal Inter	Biol 660F (3)	Virology	Biol 767 (3)	Mech Hormone Action		
	& Biogeography	Biol 760 (4)	Exp Molec Biol	Biol 666 (3)	Spec Tops Biochm	Biol 780 (3)	Molecular Genetics		
				Biol 730 (3)	Cancer Biology				

FOR ADDITIONAL INFORMATION CONTACT:
Maria Martino
Assistant to the Chair
1845 Fairmount, Box 26
Room 537 Hubbard Hall
Wichita, KS 67260-0026
T-316-978-6081
F 316-978-3773
maria.martino@wichita.edu

William J. Hendry
Chair and Professor
1845 Fairmount, Box 26
Room 537 Hubbard Hall
Wichita, KS 67260-0026
T-316-978-6081
F 316-978-3773
william.hendry@wichita.edu

Wichita State University – Fairmount College of Liberal Arts and Sciences
Department of Biological Sciences www.wichita.edu/biology

FIELD MAJOR IN BIOCHEMISTRY **Bachelor of Science (BS)**

(Biology) A12T
(Chemistry) A13T

At least 124 hours are required for graduation, and students must earn a 2.0 overall GPA, a 2.0 WSU GPA, and a 2.0 GPA in the major. Students must also complete all courses required for Liberal Arts and Sciences General Education.

Must meet with a biology or chemistry Advisor upon declaration of major.

Requirements For Major: **71-72 hours**

ALL	CHEM 211	General Chemistry I (5)
ALL	CHEM 212	General Chemistry II (5)
ALL	CHEM 531	Organic Chemistry I (5)
FL & SP	CHEM 532	Organic Chemistry II (5)
FL	CHEM 523	Analytical Chemistry (4)
FL	CHEM 662	Biochemistry I (3)
SP	CHEM 663	Biochemistry II (3)
SP	CHEM 664	Biochemistry Laboratory (3)
FL	BIOL or CHEM 666	Special Topics in Biochemistry (3)
ALL	BIOL or CHEM 669	Research in Biochemistry (2) (2) (two enrollments)
FL & SP	BIOL 210	General Biology I (4)
FL & SP	BIOL 211	General Biology II (4)
FL	BIOL 419	Genetics (4)
SP	BIOL 420	Molecular Cell Biology (4)
ALL **Either both**	MATH 111	College Algebra (3)
ALL **and**	MATH 123	College Trigonometry (3)
ALL **Or**	MATH 112	Pre-calculus Mathematics (5) (or equivalent)
FL & SP	PHYS 213	General College Physics I (5)
FL & SP	PHYS 214	General College Physics II (5)

Additional courses to satisfy the General Education Program requirements and the BS graduation requirements in Fairmount College of Liberal Arts and Sciences. **Twenty-one (21) hours,** minimum, of biochemistry electives, most likely to be chosen from the following:

FL	CHEM 514	Inorganic Chemistry (3)
SP	CHEM 524	Instrumental Methods of Chemical Analysis (4)
FL	CHEM 546	Physical Chemistry I (3)
SP	CHEM 548	Physical Chemistry II (3)
FL	CHEM 605	Medicinal Chemistry (3)
FL	BIOL 330	General Microbiology (5)
SP	BIOL 534-535	Human Physiology (3) and Laboratory (2)
	BIOL 540	Developmental Biology (4)
	BIOL 590	Immunobiology (3)
	BIOL 710	Glycobiology (3)
	BIOL 730	Cancer Biology (3)
	BIOL 760	Experimental Molecular Biology (4)
	BIOL 780	Molecular Genetics (3)
ALL	MATH 242	Calculus I (5)
ALL	MATH 243	Calculus II (5)
ALL	MATH 344	Calculus III (3)

BIOLOGY-BIOCHEMISTRY MAJORS SHOULD CONTACT MARIA MARTINO FOR AN APPOINTMENT 316-978-6081, 537 HUBBARD
CHEMISTRY-BIOCHEMISTRY MAJORS SHOULD CONATCT DEBBIE MITCHUM FOR AN APPOINTMENT 316-978-3120, 206 MCKINLEY

Dr. William Hendry, Chair
Department of Biological Sciences
537 Hubbard Hall, 316-978-3111

Dr. David Eichhorn, Chair
Department of Chemistry
206 McKinley Hall, 316-978-3120

Fairmount College of Liberal Arts and Sciences Graduation Requirements and WSU General Education Program Requirements
Fall 1994 to present

Advisor _____ Date _____

Name_____ WSU ID_____ Major_____

BA____ BS____ BGS____ Catalog Year_____

_____**BASIC SKILLS: 12 credit hours must be completed within the first 48 hours of college with a grade of C– (C minus) or better for LAS majors.**

English 101 _____ English 102 _____ Comm 111 Public Speaking _____ Math 111–**or**- Math 131 –**or**– higher _____

Required for all degrees: English or foreign language literature *and* Hist 131 or 132 as Intro Human or PolSci 121 as Intro Soc & Behav. **Major courses do not count toward Gen Ed.**

_____**ONE FINE ARTS and TWO HUMANITIES departments:**
BA/BGS: 12-15 hrs: 1 Fine Arts *and* 2 Humanities in 2 depts *and* 1 FS/IP. Also required for BA/BGS, *combined* total of 27 hours in the Humanities *and* Soc & Behav areas.
BS: 12 hrs: 1 Fine Arts *and* 2 Humanities in 2 depts *and* 1 FS/IP.

____ **Fine Arts:** Art History	Dance History	Music Composition	Theater

Communication	**Modern & Classical Languages above 210 level**
CSD	**Philosophy**
_____ **English**	**Religion**
_____ **History**	**Women's Studies**
Linguistics	Interdisciplinary/Others

_____**SOCIAL & BEHAVIORAL SCIENCES:**
BA/BGS: 12-15 hrs: 3 depts: 2 Soc & Behav Intros in 2 depts *and* 1 FS/IP. Also required for BA/BGS, *combined* total of 27 hours in the Humanities *and* Soc & Behav areas.
BS: 9 hrs: 2 depts: 2 Soc & Behav Intros in 2 depts *and* 1 FS/IP.

Anthropology	**Gerontology**
Communication 130, but not as gen ed.	____ **Political Science**
Criminal Justice	**Psychology**
Economics	**Social Work**
Ethnic Studies	**Sociology**
Geography	Interdisciplinary/Others

_____**NATURAL SCIENCES:**
BA/BS/BGS 3 courses: 2 Natural Sci Intros in 2 depts *and* 1 FS/IP: Must include 1 Biological *and* 1 Physical Science *and* 1 lab. (total of 3-4 courses depending on HS credit)

Anthropology 101, 106 / Biology	**Geology**
Chemistry	**Physics**
Geography 235	Interdisciplinary/Others

LAS Electives: Computer Science_____ Math_____ Statistics_____
Forensic Science _____ LAS I _____

_____**FOREIGN LANGUAGE:** Required for all BA Degrees & BS in CJ: 5 hours beyond the 112 level, including an intermediate level course in one language: 111 → 112 → 210 or the equivalent of 111 and 112 in two languages.

High School: _____ College/WSU: _____

GENERAL EDUCATION REQUIREMENTS: These courses must be chosen from the approved list of General Ed. courses. See catalog for details.
Record only completed courses. **If CAPP substitution ❑ is checked, the course is not on the approved General Education list.**

Areas of Study	Intro Courses - each from a different dept.	**ONE** Further Study course or **ONE** Issues & Perspectives course in each Area of Study (no more than two I&P courses)
Fine Arts (1)	_____ ❑	
	_____ ❑	_____ ❑
Humanities (2)	_____ ❑	
Social & Behavioral Sciences (2)	_____ ❑	
	_____ ❑	_____ ❑
Natural Sciences (2)	_____ ❑	
	_____ ❑	_____ ❑

Non Liberal Arts Courses _____

Bachelors Degree: At least 124 earned non-duplicate hours *and* all Gen Ed and major requirements must be fulfilled.

___ 60 hours from a 4 year institution
___ 45 hours of upper division courses (300 and above)
___ Hours in LAS: BGS = 94; BA = 100; BS = 100
___ 30 hours at WSU including 24 of last 30 hours **OR** 50 of last 60 hours
___ Maximum hours in one dept: BGS = 30; BA = 45; BS = 50
___ Maximum hours of D = 25%

2/17/2010

Faculty Research Interests

James B. Beck, Assistant Professor; Ph.D., Washington University, 2007. Plant systematics and evolution; species delimitation and evolutionary patterns in groups exhibiting polyploidy and/or asexuality; patterns of genetic variation at range edges; North American plant biogeography; herbarium curation.

George Bousfield, Professor; Ph.D., Indiana University, 1981. Reproductive endocrinology: glycoprotein hormones; mechanism of gonadotropic action; carbohydrate biochemistry.

Donald A. Distler, Associate Professor; Ph.D., University of Kansas, 1966. Aquatic biology and ecology: limnological characteristics of river basins; invertebrate distributions and life histories in river basins.

William J. Hendry III, Professor; Ph.D., Worcester Foundation for Experimental Biology/Clark University, 1982. Cellular and molecular endocrinology: endocrine disruption; estrogenic control of normal and neoplastic uterine morphogenesis; mechanisms of glucocorticoid-regulated tumor cell growth and gene expression.

Gregory R. Houseman, Assistant Professor; Ph.D., Michigan State University, 2004. Effect of immigration rates on species invasions; role of community assembly on the development of species diversity and ecosystem production; community responses to perturbations; restoration and management of ecosystems; use of native grasslands for biofuel production.

Mary Liz Jameson, Associate Professor; Ph.D., University of Kansas, 1997. Systematics, phylogeny, biodiversity, and biogeography of the Coleoptera, specifically the "megadiverse" superfamily Scarabaeoidea. Phylogenetics research integrates molecular and morphological methods. Faunistic research on scarab beetles, ecological research on dung beetles and carrion beetles, and conservation research on the endangered American Burying Beetle (Nicrophorus americanus).

Christopher M. Rogers, Associate Professor; Ph.D., Indiana University, 1988. Avian biology; cost-benefit analysis of energy storage strategies; population biology: environmental factors affecting nest success and population trajectory; migratory behavior.

F. Leland Russell, Associate Professor; Ph.D., University of Texas at Austin, 1999. Plant population and community ecology; plant-animal interactions; herbivores' effects on plant fitness and populations; cause of spatial and temporal variation in herbivore damage to plants; grassland, savanna, and woodland dynamics.

Mark A. Schneegurt, Associate Professor; Ph.D., Brown University, 1989. Applied and environmental microbiology: microbial ecology; bioremediation; bioprospecting; cyanobacteria.

Bin Shuai, Assistant Professor; Ph.D., University of California at Riverside, 2003. Molecular and cellular mechanisms underlying pollen development and function; signaling pathway mediated by pollen-specific receptor-like kinases during pollen tube growth; transcriptional regulation of pollen-specific gene expression.

Li Yao, Assistant Professor; Ph.D., University of Aberdeen, UK, 2006. Peripheral nerve and spinal cord repair and regeneration, electrical signal guided brain neuron migration, neural tissue engineering, development of implantable biomaterial scaffolds

RESEARCH FACULTY

Jeffrey V. May, Research Associate Professor; Ph.D., University of Rhode Island, 1979. Reproductive endocrinology and cell biology: intraovarian regulation of mammalian folliculogenesis; autocrine/paracrine regulation of ovarian function by polypeptide growth factors.

Paul Wolley, Professor, Ph.D. University of London, 1980.

Shang-You Yang, Associate Professor, Ph.D. Thornhill University, 2001.

GRADUATING SENIOR QUESTIONAIRE

Biological Sciences

Place a mark in the diamond in front of the statement that best answers the following questions. Your comments are appreciated!

1. Overall, do you think you got a good education in Biology, and if you had it to do over, would you major in Biology at WSU?

◊Strongly agree ◊Somewhat agree ◊Agree ◊Somewhat disagree ◊ Disagree

COMMENTS:

2. Were you able to take the courses you wanted (or needed)? If not, were appropriate substitutions offered?

◊Strongly agree ◊Somewhat agree ◊Agree ◊Somewhat disagree ◊ Disagree

COMMENTS:

3. Is the overall atmosphere of the department (faculty, teaching assistants, secretaries, etc.) one that is helpful and conducive to learning and scholarships?

◊Strongly agree ◊Somewhat agree ◊Agree ◊Somewhat disagree ◊ Disagree

COMMENTS:

4. Are there particular faculty members you would like to single out as influencing you favorably in some way or as unusually good teachers? Can you suggest areas for improvement?

◊Strongly agree ◊Somewhat agree ◊Agree ◊Somewhat disagree ◊ Disagree

COMMENTS:

5. How would you rate the facilities in the department?

◊Excellent ◊Good ◊Fair ◊Needs improvement ◊Poor

COMMENTS:

6. How would you rate the undergraduate research opportunities in the department?

◊Excellent ◊Good ◊Fair ◊Needs improvement ◊Poor ◊Did not do research

COMMENTS:

7. Where were you advised? What was your advisors name?

◊ LAS ◊ Biology ◊ Self-advised ◊ Advisor _____

COMMENTS:

DATE: _____ NAME (optional) _____

MS Graduate Student Exit Survey

Thank you for taking the time to complete this survey. Your comments will be very helpful to us as we evaluate our success in teaching skills that are important to succeeding in careers in biology or being an informed consumer of scientific information.

Part 1: Demographic Data

Gender : _____

Age: _____

Ethnicity: _____

Undergraduate university/college: _____

Part 2: Evaluation of Learner Outcomes

1. How would you rate your familiarity with current research questions and hypotheses in your area of interest in Biology?

A. I feel that I have a broad knowledge of topical research questions and hypotheses in my area of biology.

B. I have knowledge of topical research questions and hypotheses that are immediately related to my thesis topic, but not more broadly.

C. I am not familiar with topical research questions and hypotheses beyond the question I asked in my thesis.

2. How would you rate your ability to interpret and understand primary scientific literature?

A. In most instances I feel comfortable identifying the objectives of articles, understanding the major findings of the article, understanding how those findings relate to broader topics in biology and interpreting figures and tables.

B. In about half of scientific articles I have some difficulties in understanding the objectives of the article, the article's major finding, the relationship of those findings to broader topics in biology and in interpreting figures and tables.

C. Most of the time I find scientific articles to be difficult to understand.

3. In approximately how many classes during your MS career did you read and discuss primary scientific literature?

A. 0 B. ≤2 C. 2-4 D. >4

4. In what forms did you receive instruction in reading and interpreting primary scientific literature during the MS program? (Please circle multiple answers if appropriate)

A. classes

B. lab discussion groups

C. interactions with your advisor

D. other (please identify) _____

4. How would you rate your ability to design and present scientific oral presentations?

A. I understand the format of scientific oral presentations, I feel comfortable designing figures and tables for presentation as slides, I have an understanding of how to choreograph slides effectively, I can speak at a pace and volume that are readily understood.

B. There are one or two important aspects of designing and presenting scientific information orally that I struggle with, but there are other aspects in which I feel comfortable in my abilities.

C. I feel that I have learned little about giving scientific presentations and would have little idea of how to put one together without extensive guidance.

5. In approximately how many classes during your MS career did you make oral presentations and receive feedback from the instructor and/or classmates on your presentation?

A. 0 B. ≤2 C. 2-4 D.>4

6. In what forms did you receive instruction in designing and presenting scientific oral presentations? (Please circle multiple answers if appropriate)

A. classes

B. lab discussion groups

C. interactions with your advisor

D. other (please identify) _____

7. How would you rate your ability to communicate scientific research in writing?

A. I understand the content that belongs in the different sections (e.g. abstract, introduction etc.) of a written scientific document (e.g. thesis, research article), I feel comfortable with the use of basic statistics to address questions in my area of biology, I feel comfortable preparing figures and tables for presenting in a written format, during my MS program I have learned to write more concisely and with fewer proof-reading errors.

B. There are one or two important aspects of scientific writing (outlined in answer A) that I struggle with, but other areas of scientific writing with which I feel comfortable.

C. I feel that I have learned little about scientific writing and would have little idea of where to begin in writing the sections (abstract, introduction etc.) that are typically components of written scientific communication.

8 In approximately how many classes during your MS career did you received feedback on your writing?

A. 0 B. ≤2 C. 2-4 D>4

9. How did you receive your most useful instruction in improving your writing? (Please circle multiple answers if appropriate)

A. classes

B. lab discussion groups

C. interactions with your advisor

D. other (please identify) _____

10 Do you have further comments that you would like to provide for improving the Biology MS program?

Part 2: Professional and Educational Opportunities

10. Do you have a job upon graduating? If so, what is the position title and the name of your employer?

11. Have you been accepted into further graduate study (Ph.D. program, professional school)? If so, what is the name of the department and institution where you will be studying?

12. After completing the MS program in Biology, are there skills related to conducting, interpreting and communicating scientific research or are there bodies of knowledge in biology that you feel you are lacking that would help you in obtaining job opportunities or opportunities for further graduate study? Please describe those skills of bodies of knowledge that you are lacking.

12. Because knowledge of the educational/professional activities of our graduates is helpful to us in understanding how well the training that we give students prepares them for careers, would you please provide us with contact information (address or e-mail) where we might be able to contact you after graduation?

Name:

E-mail Address:

Home Address:

Please turn in completed surveys to Marcia Norton in HH 537

Learner Outcomes Evaluation Rubric for Biology Graduate Student Thesis and Capstone Defenses

Learner Outcome	Rank score for achievement of learner outcome (Circle one number or 'N/A' for each outcome)					
	1	2	3	4	N/A	Comments (Identify short-comings related to learner outcome)
Students will be familiar with topical research questions and hypotheses in their field of biology.	No reference to primary scientific literature to explain importance of their research			Student extensively and appropriately incorporates and references primary scientific literature in introductory material to build the case for the importance of their research		
Students will be able to interpret hypotheses, methods and results presented in primary scientific literature.	1	2	3	4	N/A	
	No comparison of results obtained in student's research with results in primary scientific literature. Student does not refer to results from primary literature in answering audience questions.			Comparisons of results with previous studies in the literature are well-chosen and explained in adequate depth. Student can compare results with previous studies in response to audience questions		
Students will be able to formulate testable research questions and hypotheses.	1	2	3	4	N/A	
	Hypotheses or research questions were unclear; relationship between data collected and hypotheses or research questions was unclear.			Hypotheses or research questions were clearly stated, were of a scope that could reasonably be answered in an MS thesis, the data collected were relevant to answering the hypotheses/questions		
Students will be able to design and analyze experiments or observational studies that test research questions and hypotheses.	1	2	3	4	N/A	
	Appropriate controls were not used; statistics were not used even though the questions and design lent themselves to statistical analysis; student unable to explain logic behind study design when asked questions			Controls were used appropriately; Conclusions were consistently based upon statistical analyses; Statistical analyses were appropriate for the experimental design; Student knowledgeably answered questions about the experimental design and statistics used		

Students will be able to orally communicate scientific research in meeting-style presentations and in seminars.	1	2	3	4	N/A	
	Organization was poor; slides did not complement information presented orally; speaking volume and pace were difficult; presentation did not appropriately match time specifications			Organization of the presentation was logical; slides were designed effectively and were relevant to information communicated orally; speaking volume and pace were readily understood; presentation length was appropriate		
Students will be able to communicate scientific research in writing.	1	2	3	4	N/A	
	Thesis or capstone paper organization is difficult to follow often with material presented in inappropriate sections; writing is repetitive or lacks adequate detail; excessive grammatical errors; figures and tables are difficult to interpret and do not illustrate points stated in the text.			Organization of the paper is clear and logical; subject matter covered in each section of the thesis or capstone paper is appropriate to that section; writing is concise with no proof-reading errors; figures and tables clearly communicate results and are appropriate.		

Summary of Meaning of Scores

4 – Excellent: student exhibits an above-average level of competency in almost all aspects of the learning objective; no significant deficiencies (likely would compete for admission to top-level Ph.D. program)

3 – Good: student exhibits average level of competency in many aspects of the learning objective; deficiencies may be present in some aspects of the learning objective, but they are noticeably out-weighed by above-average performance in other aspects

2 – Satisfactory: student exhibits average level of competency in many aspects of the learning objective; deficiencies in some aspects of the learning objective approximately balance above-average performance in other aspects

1 – Poor: student's performance in many aspects of the learning objective is deficient with few aspects of the learning objective where student exceeds expectations.

Please turn in completed rubric to Marcia Norton