

Academic unit: \_\_\_\_\_ Biological Sciences \_\_\_\_\_ College: Fairmount College of Liberal Arts & Sciences \_\_\_\_\_

Date of last review \_\_\_\_\_ August 2018 \_\_\_\_\_ Date of last accreditation report (if relevant) \_NA\_

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

Degree: \_\_ BS Biological Sciences/Biochemistry \_\_\_\_\_ CIP\* code: 26.0101 \_\_\_\_\_

Degree: \_\_ BA Biological Sciences \_\_\_\_\_ CIP\* code: 26.0101 \_\_\_\_\_

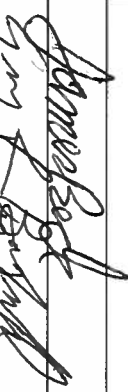





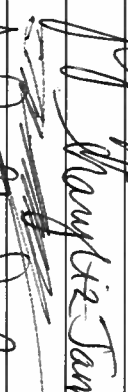

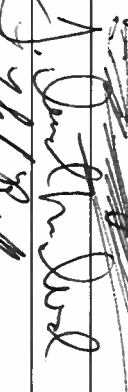

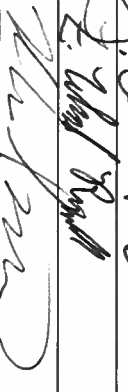
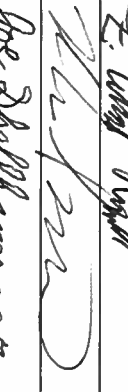
Degree: \_\_ MS Biological Sciences \_\_\_\_\_ CIP\* code: 26.0101 \_\_\_\_\_

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

Certificate (s): \_NA\_

Faculty of the academic unit (add lines as necessary)

*(If interdisciplinary, please list your core teaching faculty and department name if external to academic unit)*

NAME (List department –if external to unit)	SIGNATURE	TENURE OR NON-TENURE TRACK
Beck, James		Tenure track
Bousfield, George		Tenure Track
Hendry, William		Tenure Track
Houseman, Gregory		Tenure Track
Jameson, Mary Elizabeth		Tenure Track
Luhring, Thomas		Tenure Track
McDonald, J. David		Tenure Track
Russell, F. Ieland		Tenure Track
Schneegurt, Mark		Tenure Track
Shellhammer, Joe		Non-Tenure Track
Shuai, Bin		Tenure Track
Yao, Li		Tenure Track

Submitted by: William J. Hendry - Chair Professor Date 4/1/2022  
(Name and title) (Date)

Please note that the signatures indicate that each faculty has read the self-study template and agreed (by consensus) to its contents.

In yellow highlighted areas, data will be provided

## Part 1: Departmental Purpose, Relationship to the University Mission and Strategic Plan engagement

*Please list the program purpose statement. Explain in 1-2 concise paragraphs the role of the program and tie them to the University mission (printed below) and strategic plan.*

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

### A. Program Purpose Statement - formerly Mission

(If more than one program, list each purpose statement):

UNDERGRADUATE PROGRAM—The Department of Biological Sciences program purpose is to provide high-quality teaching for both undergraduate and graduate students. Additionally, we provide 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. Our teaching and research agendas include a balance of both organismal/ecology and cell/molecular activities.

MASTER OF SCIENCE GRADUATE PROGRAM --The purpose of the Master 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.

### B. The role of the Program(s) and relationship to the University mission:

UNDERGRADUATE PROGRAM—The Department of Biological Sciences supports the university mission to serve as an educational, cultural, and economic driver for Kansas and the greater public good in the following ways: Offering a comprehensive core curriculum that prepares our students for careers in research, environmental studies, medicine, and other post-baccalaureate studies. Also, we participate in the Watkins Program along with the departments of chemistry, geology, and physics. 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. We also assist the outreach mission of the Fairmount College of Liberal Arts and Sciences by participating in the state Science Olympiad competition, the Kansas Junior Academy of Science, Expanding Your Horizons (a STEM program for middle school girls) and activities that focus on science and math education for middle and high school students both locally and statewide. We provide lab space and support to the Upward Bound Math Science TRIO summer programs. All department seminars are advertised and open to the public to allow interactions among scientist and community members. Our field station sites (Ninnescah, Sellers, Gerber Reserves, and the Youngmeyer Ranch) include native and restored prairie tracts that are used by many local community groups (boy and girl scouts, field trips by schools) and other researchers in the state to investigate and demonstrate environmental principles and concerns.

MASTER OF SCIENCE GRADUATE PROGRAM -- The Biology MS program furthers Wichita State University's mission because research in and knowledge of biological systems is foundational to Kansas industries and underlies many topics of current societal debate. Economic vibrancy in biomedical, biofuels and agricultural industries depends upon a workforce that can develop and understand new biological knowledge. The Biology MS program provides intensive training in interpreting and conducting original scientific research. For students who do not pursue a career in biology, exposure to the process by which new scientific knowledge is discovered prepares them to understand scientific findings that inform ongoing policy debates.

C. *Has the purpose of the Program(s) changed since last review?* ☐ Yes ☒ No

If yes, describe in 1-2 concise paragraphs. If no, is there a need to change?

D. *How does the Program support the university strategic plan?*

Describe in 1-2 concise paragraphs.

UNDERGRADUATE PROGRAM—Our program supports the university's strategic plan by engaging with potential, current, and former students to identify areas that need improvement as well as continuing to engage with practices that benefit our students. Initially, students meet with a OneStop advisor for their first year of advising, but our undergraduate coordinator reaches out to them initially to map a 4-year plan that specifically addresses the student's long-term goals. The undergraduate coordinator e-mails students at critical points in the semester to remind them of deadlines or upcoming events. Students are regularly reminded that our college (LAS) has a success coach who can help them with the transition to higher education. Over the past 10 years we have invited previous masters' graduates to present seminars in our Biol 497/797 seminar series. Recently, a fund was endowed that could help support the travel costs to bring these speakers to campus. Our current students can see themselves moving into these types of careers from someone who has walked a similar path in biological sciences. Additionally, we participate in recruitment events with admissions, specifically during Black and Yellow events as well as individual campus visitors. Our evaluations from these events always receive high marks from potential students.

MASTER OF SCIENCE GRADUATE PROGRAM --The Biology MS program advances the university strategic plan through its student-centered focus, dedication to innovative faculty research and student research training, efforts at inclusive excellence and partnerships and engagement with other universities, industry, and government agencies. Here we briefly profile one example of the commitment of the Biology MS program in each of these key areas of the university strategic plan. For student-centeredness, the Biology Department fosters student professional development by sponsoring weekly student lunches with visiting departmental seminar speakers and inviting students to join invited speakers and faculty for dinner. These professional interactions give students a novel example of a career trajectory in biology, an external perspective on their own thesis research and career plans, potentially important contacts in their area of interest and, by drawing speakers from diverse backgrounds, a greater sense of personal connection to the community of biologists. Dedication to research and developing the next generation of researchers is evidenced by the fact that Biology faculty administered research grants worth >\$17 million during the evaluation period and graduate students were lead or co-authors on 19 peer-reviewed articles and 4 book chapters (section 2B). Progress toward inclusiveness is evidenced by the current composition (fall 2020-spring 2022) of the Biology MS program, which includes >15% students from under-represented groups in science. The excellence of these students is evidenced by their acceptance into biology-related PhD programs and obtaining career positions with biology-related government agencies and industry (section 4D). Finally, partnerships and engagement are evidenced by faculty members' roles in large multi-institutional grants from the National Science Foundation, the National Institutes of Health, NASA, research collaborations with government agencies and non-profit organizations, such as the Kansas Department of Parks and Wildlife and The Nature Conservancy, and collaborations with industry partners, such as OceanSpray Inc.

E. *Provide an overall description of your program (s) including any changes made since the last review?*

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 (degree check sheet appended). All students take the same five 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 students' endeavors that well prepare them for careers in medicine, environmental studies, education, research, and post-baccalaureate studies. 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 undergraduate 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 2: 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 3: 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: Assessment by the students will be part of the department's review of the undergraduate program.

OBJECTIVE 4: Students will anonymously provide their perceptions of the strengths and weaknesses of the undergraduate major utilizing a written survey instrument (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:** Our learner-center goals/objectives/outcomes and our programmatic goals/objectives have not changed since the FY 2015 – FY 2017 program review.

#### **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:**

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**

We employ a multi-faceted approach to evaluate the MS program's efficacy in meeting our learner-centered objectives. First, we determined the current activities of our graduates using on-line searches of professional networking sites and surveys of faculty about the activities of recent graduates from their labs. Second, we evaluated thesis defenses and 'capstone project' defenses (non-thesis track) using a 'learner outcomes' rubric that is completed by Biology faculty on the thesis or capstone committee. This rubric provides information about whether students obtained the skills and behaviors required to follow career paths identified in our objectives. Finally, we continued assessing students' preparation to meet our learner-centered objectives through faculty evaluations of student professional presentations given in our departmental seminar series. This assessment tool provides information on students' progress toward attaining skills needed to meet our learner-centered objectives while they are still in the MS program.

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  $\geq 1$  peer-reviewed publication per year.

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

#### Measurement tools for programmatic objectives

We use annual faculty activity reports that provide data to evaluate whether the programmatic objectives are being met.

The one change that we made to the Biology MS program since the FY 2015 – FY 2017 program review was, in 2021, to increase the English proficiency requirement for admission of international students. During the FY 2015 – FY 2017 review cycle and during the current review cycle, we admitted international students whose English proficiency met the baseline university requirement, but they did not have the English skills to perform well in technical coursework during their first semester, be effective in research or pass the SPEAK test and receive financial support as a graduate teaching assistant in the second semester. We believe that an enhanced English proficiency requirement that provides greater confidence that incoming international students will be prepared to succeed represents the “fair” approach for the student and will lead to more efficient use of faculty and staff time.

## Part 2: Faculty Quality and Productivity as a Factor of Program Quality

*The quality of the program/certificate as assessed by the strengths, productivity, and qualifications of the faculty in terms of scholarly/creative activity and service. (Refer to instructions in the WSU Program Review Instructions for more information on completing this section. Tables 4 (Instructional FTE), 6 (Program Majors) and 7 (Degree Production) from OPA can be used to help with this section.)*

Complete the table below for the faculty who support the program (all faculty who signed or should have signed the coversheet). Table 1 Departmental Outputs																	
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				
2017-2018	18	0	17	0											7	19 awards, 38 submitted	5,607,410
2018-2019	33	0	48	0											0	23 awards, 41 submitted	6,227,719
2019-2020	31	0	19	0											0	27 awards, 31 submitted	5,113,012
2020-2021	29	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	13 awards 28 submitted	2,198,797

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

**A. Briefly explain the standards in place in your college/department for the evaluation of your faculty research/scholarship/creative activity. If an interdisciplinary program, please report on the program where faculty research has been recorded and provide narrative related to productivity.**

The standard mechanisms for disseminating research results in Biology are peer-reviewed journal articles and presentations at professional meetings. Therefore, the small numbers of books and conference proceedings published as well as performances and exhibits are to be expected. Grant funding is very important to biological research in supporting equipment and supply needs, student and technician wages/salaries and travel.

*B. Provide a brief assessment of the quality of the faculty/staff using the data from the table above. Include details related to productivity of the faculty including scholarship/research and creative activity and services. (i.e., some departments may have a few faculty producing the majority of the scholarship, service, efforts to recruit/retain faculty, departmental succession plans, etc.)*

For the years requested in the table at the beginning of Part 2 (2017-2018 – 2019-2020) the number of tenure or tenure-track graduate faculty in the Biology Department remained stable at 11. Dr. Tom Luhning, an aquatic ecologist, joined our department in fall 2019. Spring and summer 2020 were highly disrupted by the outbreak of the Covid-19 pandemic that required faculty to substantially re-direct time and efforts to adapting courses to an on-line format. Data provided in the above table are drawn from faculty activity reports for 2018, 2019, 2020, and 2021.

The Biology MS program and graduate faculty were quite successful in meeting the three programmatic objectives in section 1E. First, we met programmatic objective #1 of maintaining an MS program with an average of 1-2 graduate students per graduate faculty member. In 2017-2018, 2018-2019 and 2019-2020, the Biology MS program included 21, 16 and 19 students, respectively. Over this interval, the minimum average number of graduate students per graduate faculty member was 1.6. The graduate program was productive in graduating MS students, graduating 11, 6 and 7 students in 2018, 2019, and 2020, respectively. Second, we exceeded programmatic objective #2 of producing at least one peer-reviewed publication per graduate faculty member per year, producing 1.8, 3.0 and 2.81 peer-reviewed publications per graduate faculty member in 2018, 2019, and 2020, respectively. Third, we came close to meeting programmatic objective #3 of attending at least one national or international conference per year, making presentations at 0.89, 1.44, and 1.0 national or international meetings per graduate faculty member in 2018, 2019, and 2020, respectively. Of course, the Covid-19 pandemic eliminated national and international meetings in spring and summer 2020.

The high quality of faculty research programs in the Biology Department is illustrated by frequent requests for professional service and success in obtaining external research funding. For 2018-2020, biology faculty performed 59 manuscript peer-reviews for national and international journals, two faculty served as grant review panelists for national funding organizations, two faculty served on editorial boards of three international journals and one faculty member edited a book. During 2018-2020, Biology faculty continued performing research on and administering grants awarded during previous evaluation periods worth ~\$17,000,000. These awards are from highly competitive national funding agencies such as the National Science Foundation, NASA, the National Institutes of Health, as well as less traditional sources such as Kansas Department of Parks and Wildlife, the Kansas Soybean Commission, and the National Wild Turkey Federation.

Dynamic faculty research programs benefit graduate students. During the evaluation period, graduate students were lead authors or co-authors on 19 peer-reviewed articles and 4 book chapters. Further, graduate students were lead presenters or co-presenters on 19 national or international conference presentations. Graduates' success in gaining admission to PhD and advanced professional programs (MD and DDS) demonstrates that other scientists and medical professionals recognize our students' excellent training. In fact, 36% of our MS graduates 2017-2018 – 2019-2020 are pursuing PhD, MD or DDS degrees.

## Part 3: Academic Program(s) and Emphases

*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).*

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### A. Undergraduate programs:

1. Please review Table 8 provided by the Office of Planning and Analysis. Is the program ACT below 20 (triggered by KBOR defined Minima)? ☐ Yes ☒ No

If yes, please explain the average ACT scores for your students.

### B. Graduate programs:

1. Please review Table 9 provided by the Office of Planning and Analysis. Is the program GPA below the university average? X Yes ☐ No

If yes, please explain the average GPA of your graduate students.

The average GPA of students admitted to the Biology MS program for FY 2018 – FY 2020 was 3.3. The GPA of students admitted to the Biology MS program has been lower than the GPA of graduate students admitted across the university since FY 2011. This likely reflects the fact that aspects of applicants' undergraduate experiences beyond grades, most importantly the nature of applicants' undergraduate research experiences, factor significantly into our admission decisions.

### C. Accreditation status: *If accreditation is previously noted, please add:*

Accrediting Body:

Next Review Date:

Commendations and concerns from the last review:



### D. Assessment of Learning Outcomes

1. Complete the table below with program level data. Identify the principal learning outcomes (i.e., with what skills does your Program expect students to graduate) and provide aggregate data on how students are meeting those outcomes

*You may add an appendix to provide more explanation/details. (If specialty accreditation has been conferred within 18 months of this process, programs can append the information from the accreditation document to this self-study and cite, with page number, the appropriate information. If specialty accreditation has not been affirmed within 18 months, please complete the table or submit an updated version of your accreditation information. If not accredited, please complete the table below).*

Table 2 Learning Outcome Assessment UNDERGRADUATE PROGRAM BIOLOGICAL SCIENCES					
Learning Outcomes (most programs will have multiple outcomes)	Assessment Type (e.g., portfolios, exams)	Assessment Tool (e.g. rubrics, grading scale)	Target/Criteria (desired program level achievement)	Results YR 1 = su, & fl '17 & sp '18 YR 2 = su & fl '18 & sp '19 YR 3 = su & fl '19 & sp '20	Analysis
<i>Students will have a basic understanding of human anatomy.</i>	<i>Comprehensive Exam</i>	<i>Rubric</i>	<i>80% of students will score 80% Or &lt;</i>	<i>90% of students scored 80% or better.</i>	<i>Proficient knowledge of anatomy has been demonstrated.</i>
1-Students will develop a broad knowledge of biological concepts.	National Comprehensive Exam	ETS Major Field Achievement Test in Biology certified for graduation	Average of all WSU graduates will be at or above the national mean.	BIO:National YR 1-152.9:151.6 +/-7.6 YR 2-154.0:152 +/-7.3 YR 3*160.2:151.8 +/-7.4	Goal met in Yr 1 & 2. *YR 3-no spring 2020 MFT exams given (COVID restrictions)
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 (each student must take Biol 497 or 499 to complete their degree)	Biol 497- Colloquium and Biol 499- Undergraduate Research	100% satisfactory grades	Biol 497/499 YR 1: 50/54 YR 2: 38/56 YR 3: 40/45	Goal met
4. Assessment of the program using department	Exit survey	Graduating senior department survey-	75% of graduating seniors will agree they received a good education at WSU.	N=66 YR 1-90% N=57 YR 2-90% N=YR 3 data unavailable	Goal met, Yr 1 & 2

survey for graduating seniors.		attached in appendix			
<p><b>Definitions:</b></p> <p><b>Learning Outcome:</b> Learning that should result from instruction.</p> <p><b>Assessment Type:</b> Type of assessment used to identify, collect, and prepare data to evaluate the achievement of learning outcomes (e.g., a writing project evaluated by a rubric).</p> <p><b>Assessment Tool:</b> Instrument used to evaluate the achievement of learning outcomes.</p> <p><b>Criterion/Target:</b> Percentage of 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).</p> <p><b>Result:</b> Actual achievement on each learning outcome measurement (e.g., 95%).</p> <p><b>Analysis:</b> 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</p>					

Table 3 Learning Outcome Assessment MASTER OF SCIENCE BIOLOGICAL SCIENCES					
Learning Outcomes (most programs will have multiple outcomes)	Assessment Type (e.g., portfolios, exams)	Assessment Tool (e.g. rubrics, grading scale)	Target/Criteria (desired program level achievement)	Results	Analysis
<i>Students will have a basic understanding of human anatomy.</i>	<i>Comprehensive Exam</i>	<i>Rubric</i>	<i>80% of students will score 80% Or &lt;</i>	<i>90% of students scored 80% or better.</i>	<i>Proficient knowledge of anatomy has been demonstrated.</i>
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 thesis / capstone advisor)  2. MS graduate student exit survey (completed by graduating student)  3. Graduate student departmental seminar presentation evaluations (completed by faculty)	1. Rubric  2. Survey with rankings and written responses  3. Rubric	1. average score of 3 or 4  2. majority of graduates indicating the highest level of confidence with the learning objective.  3. Improvement from first presentation to second presentation.	1. Thesis (15 students): mean = 3.8; Non-thesis (2 students): mean = 3.0  2. 87.5% indicating highest level of confidence (8 respondents)  3. 8.33% improved (75% unchanged) from first to second presentation (12 students surveyed).	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  2. MS graduate student exit survey	1. Rubric  2. Survey with rankings and written responses	1. average score of 3 or 4  2. majority of graduates indicating the highest level of confidence with the learning objective.	1. Thesis: mean = 3.53; Non-thesis: mean = 2.5  2. 100% indicating the highest level of confidence	Please see analysis at end of table
Students will be able to formulate testable research questions and hypotheses.	1. Learner outcomes rubric for MS defenses  2. Graduate student departmental seminar presentation evaluations	1. Rubric  2. Rubric	1. average score of 3 or 4  2. Improvement from first presentation to second presentation.	1. Thesis: mean = 3.67; Non-thesis: mean = 2.5  2. 14.3% improved (71.4% unchanged) from first to second presentation.	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  2. Graduate student departmental seminar presentation evaluations	1. Rubric  2. Rubric	1. average score of 3 or 4  2. Improvement from first presentation to second presentation.	1. Thesis: mean = 3.67; Non-thesis: mean = 2.0  2. 9.1% improved (63.6% unchanged) from first to second presentation.	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  2. MS graduate student exit survey  3. Graduate student departmental seminar	1. Rubric  2. Survey with rankings and written responses  3. Rubric	1. average score of 3 or 4  2. majority of graduates indicating the highest level of confidence with the learning objective	1. Thesis: mean: 3.71; Non-thesis: mean: 3.0  2. 100% indicating highest level of confidence  3. 8.3% improved (83.3% unchanged)	Please see analysis at end of table

	presentation evaluations		3. Improvement from first presentation to second presentation.	from first to second presentation.	
Students will be able to communicate scientific research to other scientists in writing.	1. Learner outcomes rubric for MS defenses  2. MS graduate student exit survey	1. Rubric  2. Survey with rankings and written responses	1. average score of 3 or 4  2. majority of graduates indicating the highest level of confidence with the learning objective	1. Thesis: mean: 3.35; Non-thesis: mean: 3.0  2. 100% indicating highest level of confidence	Please see analysis at end of table



2. Provide an analysis and evaluation of the data by learner outcome with proposed actions based on the results listed in Table 2. Data should relate to the goals and objectives of the program as listed in Part 1.

**UNDERGRADUATE PROGRAM**—The major field test in biological sciences is a standardized exit exam provided by ETS (Educational Testing Services) allowing a comparison of our students to approximately 397 institutions (3-year average of institutions administering the exam since summer 2017). In the current program review cycle, our students were slightly higher than the overall average indicating our students have developed a broad knowledge of biological concepts. All students must enroll in Biol 497-seminar or Biol 499-undergraduate research and in the past 3 years we have met the goal of 100% satisfactory grades. Our exit survey data indicates that 90% of our students agree they received a good education in our program. The remaining 10% surveyed, disagreed, and would not pursue a biology degree. These students stated job limitations (students who want to remain in the area or unable to relocate out of state), not interested in ecology coursework, and having to do work outside of classroom time.

**MASTER OF SCIENCE GRADUATE PROGRAM**—Results from our 'Learner Outcomes Rubric for MS Defenses' and our 'MS graduate student exit survey' indicate that faculty feel that graduating students have achieved a high degree of proficiency in skills related to our six learner outcomes and that graduates also feel highly competent in these skills. In comparison to results from the FY 2015-FY 2017 program review, faculty rankings of student performance in MS defenses indicated improvement in students' abilities to design and analyze experiments and observational studies (2015-2017: mean = 3.31, current: mean = 3.67) and in students' abilities to communicate scientific research in writing (2015-2017: mean = 3.13, current: mean = 3.35). The only outcome with a decrease from the previous review period was students' ability to interpret primary scientific literature (2015-2017: mean = 3.81, current: mean = 3.53). Across both review periods, faculty ranked students' abilities to communicate scientific research in writing lowest among our learner outcomes, but still above our target level of competency. In the current review period graduating students indicated a higher level of confidence in their achievement of our learner outcomes than in the FY 2015 – FY 2017 review cycle. Exit surveys show students are receiving training in most skills indicated by the learner outcomes through multiple routes. 58% of respondents indicated they had received training in reading primary scientific literature through classes and interactions with their advisor. Similarly, 42% of respondents indicated they received training in oral presentation and scientific writing through classes and interactions with their advisor. Few students cited lab discussion groups as a mechanism by which they were trained in our learner outcomes; <17% of respondents for all learner outcomes.

Graduate student seminar presentation evaluations most frequently indicated no substantial change in student proficiency in the learner outcomes from the first to second presentation. Generally, students receive high rankings from faculty in even their first presentation, so opportunities for improvement between presentations are limited. In addition, the identities of the faculty members completing the evaluations may change from the first to second presentation, so that may obscure patterns. Nevertheless, the lack of change in performance may indicate that we should provide students with more coaching in improving weak aspects of their first seminar presentation. We cannot compare results for this assessment tool between FY 2015 – FY 2017 and the current review because we had just implemented this assessment tool late in the previous review cycle and had very small sample sizes.

## *E. Assessment of Student Satisfaction*

Table 4 Student Learning Outcomes Comparison

Aggregate data supporting student success, by year, for the last four years (e.g., capstone, licensing/certification exam pass-rates)				
Year	N	Name of Exam	Program Result	National Comparison Average
		<i>Subcategories of MFT exam in biology</i>	<i>Average</i>	
2017-18	58	Cell Biology Molecular Biology & Genetics Organismal Biology	53.4 56.6 52.6	51.9 51.8 51.9
2018-19	63	Population Biology; Evolution, and Ecology Cell Biology Molecular Biology & Genetics Organismal Biology	51.9 53.9 56.4	50.9 51.7 52.7
		Population Biology, Evolution, and Ecology	52.7	51.6
		Population Biology, Evolution, and Ecology	53.8	51.0
2019-20	15*	Cell Biology Molecular Biology & Genetics Organismal Biology	54.2 55.8 61.3	51.5 52.7 51.4
		Population Biology, Evolution, and Ecology	57.6	50.9

3. Use Table 3 and OPA Table 10 to provide analysis and evaluation using student majors' satisfaction (e.g., exit surveys from the Office of Planning and Analysis), 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 3d) to illustrate student satisfaction with the program and perceptions of program value.

UNDERGRADUATE PROGRAM: All students must take a university wide exit exam, but not all biology students take the anonymous exit survey in our program. We find from the university exit survey (rolling 5-year average (2016-2020) that 74.7% of our students are satisfied or very satisfied. Additionally, the major field test of biology performance of our students is slightly above the national average (table 2) and we do well in all subcategories (table 4). These results are a clear indication that our students are satisfied and perform well compared to national averages. Our exit surveys indicate students enjoy the overall atmosphere of our faculty and staff and each semester at least one student highlights each of our faculty as being exemplary. During this program review cycle, we suddenly lost 2 faculty members on the ecological side which impacted our ability to offer our usual breadth of ecology coursework. We added a faculty member to the ecological side allowing us to expand the diminished course offerings. Student dissatisfaction with the program is in two areas: frequency of course offerings and our facilities. Frequency of course offerings is problematic without additional faculty to teach these courses. We post our major course rotation with all additional science requirements to assist students in planning and find that if this tool is utilized, students can complete biology elective coursework of their interest. In the summer of 2020, the university funded a renovation of 2 existing teaching lab into 3 teaching labs. These facilities now have adjustable and movable lab benches, new lab stools, and updated technology. Uncomfortable lab stools in teaching labs are mentioned often on the exit survey. Since at least 30 to 40% of classes are in a teaching lab this upgrade was welcome. Since the renovation, we have replaced lab stools in 3 established teaching labs and will complete chair replacement in the 2 remaining labs over the next year (cost to purchase new lab stools is approximately \$3,500/teaching lab. Lab fees were used to allow this upgrade). Our undergraduate advisor always receives high marks for being honest, open, and, helpful.

MASTER OF SCIENCE GRADUATE PROGRAM: For the Biology MS program, individual academic year data, as appears to be requested in Table 3, is not meaningful because of small sample sizes. Data across the entire evaluation period are more robust and comparisons among multi-year evaluation periods are more likely to illuminate trends.

According to OPA Table 10, 'Application for Degree' exit surveys showed that our graduates are well satisfied with their experience in the Biology MS program. For 2018, 2019 and 2020, 100%, 87.5% and 85.7% of our graduates indicated that they were 'satisfied' or 'highly satisfied' with their graduate school experience. These percentages are higher than the College of Liberal Arts and Sciences and the University averages in each year. Mean levels of satisfaction by Biology MS program graduates are the same as for the FY 2015 – FY 2017 review period (91.4% vs. 91.6%) and both are higher than during the FY 2012 – FY 2014 review period (78.2%).

Our departmental 'MS Graduate Student Exit Survey' asks graduate students for suggestions to improve the Biology MS program. During the current evaluation period, these suggestions primarily called for a greater diversity of courses, including technical skill courses, and more professional development opportunities. A sampling of these comments is below. These improvements will be difficult to achieve, especially for increased course offerings, with the current number of faculty and staff in the Biology Department, which is far less than Life Science Departments at our peer institutions (data provided in the Additional Narrative section at the end of the program review document). For professional development, note that in the semester that Covid-19 shutdown WSU, we were formulating a schedule of faculty and staff volunteers to participate in departmental graduate student lunches to provide professionalism training.

#### **Need for greater diversity of courses**

There needs to be a wider array of classes available. The Biology Department lacks some important courses that make the program less desirable compared to other universities. It really needs to expand and add more professors and research opportunities. More funding would help better support graduate students as well.

I feel that our program is lacking in its ability to teach students technical / computer skills that are applicable to our fields. While we have classes, such as Computing for Biologists, Biostats and even Intro to Ecology, that teach the basics of R and other programs, it would be more useful to students to have courses dedicated to R, Python and an improved ArcGIS course that is more than just following the online ESRI tutorials.

I wish there was an Intro Plant Pathology course.

#### **Professional development opportunities**

Development of CVs is a little-discussed topic in the MS program. I also feel unprepared to convert my CV into a resume. Although land management careers are prominent in Kansas, WSU provides very little education in this field. This education would likely increase the number of job opportunities available to WSU MS graduates.

There was no departmental info on grant writing and I feel that would help all of us. Same goes for CV / resume making. It's a widely applicable skill that could be addressed in the department. These are key areas when it comes to getting jobs.

Although I was able to mentor undergraduate students, most of my MS cohort did not have close interactions with undergrads. Making opportunities to connect undergrad and grad students more available would be immensely beneficial to all people involved.

## F. General Education

1. Does your program support the university General Education program? X Yes ☐ No

If yes, please complete the table below by listing the general education courses and noting which of the general education outcomes are addressed in the class. If no, skip this question.

Table 5 General Education Outcomes

Course	Results	Assessment Type	General Education Outcomes			
			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
<i>Math 242: Calculus I</i>	<i>2016: 96% passed 2017: 87% passed 2018: 96% passed 2019: 95% passed</i>			x		x
Biol 106: Human Organism	2019: 84.4% grade of C- or above	Quizzes and written reports on videos	X	X	X	
Biol 370: Intro to Environmental Sciences	2019: 82.2% grade of C- or above	Exams, written reports on videos & paper	X	X	X	

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/>

## G. Use Table 4 to further explain which goals of the WSU General Education Program are assessed in undergraduate programs (optional for graduate programs) and the results.

We have an online instructor in the department who offers online and in person general education courses. The data available indicates that students do well in the two courses with the largest enrollment. Also, per the instructor, many students who take Biol 106 also continue and take Biol 370. These data are incomplete: OPA will have data by Friday, 4/7.

## H. Concurrent Enrollment

1. Does the program offer concurrent enrollment courses? ☐ Yes X No

If yes, 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.



If no, skip to next question.

## ***1. Credit Hours Definition***

1. Does the Program assign credit hours to courses according to Wichita State University Policy 2.18?  
X Yes ☐ No

If no, provide explanation.

### ***J. Overall Assessment***

Define the overall quality of the academic program based on the above information 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).

**UNDERGRADUATE PROGRAM:** Our program allows flexibility for students to pursue biomedical as well as ecological careers. Each discipline has many overarching aspects that provide a well-rounded biology education with an emphasis in their area of interest. In each of these groups there are students who want to focus solely on one area or another, but we feel an excellent core allows them potential to see the interactions in all biology. This approach prepares them for most careers in biology.

**MASTER OF SCIENCE GRADUATE PROGRAM:** The quality of the Biology MS program is high. Enrollment met our goal of 1-2 graduate students per faculty member, although our total number of graduate students dipped below our desired program size of 20. Further, a high proportion of students graduate within 2-2.5 years. Of the 20 students who enrolled in the Biology MS program in the first 2.5 years of this evaluation period (fall 2017 through fall 2019), 15 (75%) graduated in <2.5 years, four more graduated within 3 years and one has not graduated. Frequent authorship by graduate students on peer-reviewed publications and conference presentations demonstrates they are conducting meaningful research that contributes to the greater public good in Kansas and beyond. Further, generally positive results from our assessment tools and our graduates' success in finding employment or positions for advanced study (section 4A) indicate success in meeting our objectives and learner outcomes. Finally, graduates continue to report a high level of satisfaction with the Biology MS program.

## Part 4: Student Need and Employer Demand

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

**Complete the table below.**

*Table 5 Employment of Majors 2020-2021*

For the Biology/MS program, we are providing data for 2017-2018, 2018-2019 and 2019-2020 as employment data from a single year of graduates does not provide adequate sample size for a research-based, advanced degree program.

Program Name	Avg. Salary	Employment in state (%)	Employment in the field (%)	Employment related to the field (%)	Employment outside the field (%)	Pursuing graduate or professional education (N)	Projected growth from BLS**
Biology Master of Science	\$55,724 (BLS statistics)	27.3% (6/22)	50% (11/22)	50% (11/22)	4.5% (1/22)	36.4% (8/22)	8.1% (Average from BLS statistics)
BS Biology (low response rate to survey, all 3 years combined) N= 25	\$46,340*yr (BLS data)	28.0% (7/25)	40.0% (10/25)	0% (0/25)	4.0% (1/25)	28% (7/25)	7% (fast as average from BLS data)

\* [https://ksdegreestats.org/program\\_search.jsp](https://ksdegreestats.org/program_search.jsp) and U.S. Bureau of Labor Statistics Website: <http://www.bls.gov/oco/>, are good resources to view job outlook data and salary information (if the Program has information available from professional associations or alumni surveys, enter that data).

**List any triggered programs with reason (majors/faculty/graduates).**

- 1.
- 2.
- 3.

**A. 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. Programs that are triggered for graduates or majors should get particular attention.**

**UNDERGRADUATE PROGRAM:** Responses to our follow up surveys with biology graduates are poor. Based on the responses received, our students find work in their field or have been admitted to a graduate or professional program. One issue seen during advising is a student who wants to remain in the Wichita area. While there has been some growth in Wichita in the past 5 years, job opportunities in this area are limited (excluding medical professionals). However, if a student is willing to relocate the demand for biology graduates is strong.

MASTER OF SCIENCE GRADUATE PROGRAM: Student demand for the Biology MS program is healthy. For FY 2018-2020, the number of applicants to the Biology MS program remained steady, varying from 33-35 per year. This represents an increase from FY 2017 when we had 27 applicants. For FY 2018 – FY 2020, we admitted, on average, 12.3 applicants per year to the Biology MS program and enrolled 9 applicants per year. Since the MS degree requires 2-2.5 years to complete, these numbers are consistent with our goal of 1-2 graduate students per faculty member. However, the total enrollment in the Biology MS program has dipped below our desired level of  $\geq 20$  students.

Employer demand and demand for our graduates by advanced degree programs is high. 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 22 graduates from our MS program during the 2017-2018 – 2019-2020 interval for whom we could determine current activities, 18.2% (4 / 22) are in biology-related PhD programs and 18.2% are in medical school or dental school. 13.6% of our graduates (3 / 22) are research technicians / lab managers in medical school or medical center labs. 13.6% of graduates are employed in industry; two as environmental engineers and one as a medical assistant. 9.1% of graduates (2 / 22) are employed with government agencies, both as agricultural research technicians with USDA. 18.2% of our graduates are employed in science education; three as university lecturers, administrators or museum collections managers and one in secondary education. 9.1% of graduates are not employed, but this includes one returning student for whom obtaining an advanced degree was a personal challenge goal. Graduates from the Biology MS program are succeeding in finding positions for advanced study, in industry, government agencies, and education.

***B. Briefly describe how the department and faculty have engaged in undergraduate strategic enrollment management including recruitment and retention activities and provide an assessment of successes, challenges, and deficiencies with those activities.***

The department engages with all recruitment events on campus from campus visitors to Black and Yellow Days. The biology one sheet (one sheet that highlights our department) was completed and is used by LAS advising when they do off campus recruitment events. Retention activities include multiple e-mails to all biology students with notifications of events, job opportunities, advising reminders. Our hallways are lined with research posters involving both graduate and undergraduate students so students can learn about research projects. Some Biology majors who are pre-med do realize that biology/ medicine is not the correct choice for them and want to change their major. We discuss options for other degrees at WSU as well as encouraging involvement with career pathways to determine a better fit for the student. Advising in the department concentrates on long term goals and encourages second and third options given the competition for admission to medical programs. Faculty, graduate teaching assistants, and lecturers regularly recommend students meet with a success coach to hone their study skills to prepare them for the natural sciences coursework.

***C. Briefly describe how the department and faculty have engaged in graduate strategic enrollment management including recruitment and retention activities and provide an assessment of successes, challenges, and deficiencies with those activities.***

The Biology Department purchases a Petersons.com profile web page for the Biology MS program. First, this is an additional website, beyond the WSU web site, where we communicate the strengths of our MS program to potential applicants through text, images, and videos. Second, Peterson's provides leads of students who have visited our web page and the graduate coordinator follows-up with these students by email. However, some of the most effective recruiting occurs by individual faculty through connections they make with undergraduates conducting research in their labs or when faculty who have openings in their labs communicate with colleagues at other universities or post ads to listservs. Faculty also are involved in regional organizations and conferences, such as KINBRE, Kansas Academy of Science, and the Kansas Natural Resources Conference, where there is the opportunity to attract undergraduates from other Kansas institutions.

We make efforts to maximize retention of admitted students by 1) ensuring that the students we admit are prepared to succeed in the MS program, 2) attempting to foster a sense of community among Biology graduate students and 3) providing a non-thesis option as an alternative path to a degree for students who struggle with thesis research. First, to ensure that admitted students are prepared to succeed, during this review interval we increased our English proficiency threshold for international students to a level that better reflects the proficiency required to succeed in coursework in the first semester, start promptly on thesis research, and be prepared to function as a graduate teaching assistant by the second semester. Second, we take various strategies to foster community among graduate students, including gathering for departmental seminar on Monday afternoons and hosting a graduate student lunch with seminar speakers on Monday noons. Third, the non-thesis option presents a coursework-focused path to an MS degree that still involves a 1-2 semester research or internship experience (as opposed to 4 semesters of research for the thesis-track). The non-thesis track has rescued five students during academic years 2017-2018 to 2019-2020 that otherwise would have left the program without a degree.

Two persistent challenges are to 1) matriculate international applicants who we admit and 2) attract well-qualified domestic applicants. Between financial constraints and visa issues, our success in enrolling admitted international students is quite low. To increase our success in enrolling strong international applicants, it would be helpful to re-instate an 'international student graduate research assistant position' that the College of Liberal Arts and Sciences provided to us between 2009 and 2015. LAS provided a \$5000.00 stipend and the Biology Department paid the students' in-state tuition. This overcame two substantial financial problems for enrolling international graduate students: 1) most do not have the English proficiency to reach in their first semester; and 2) faculty are justifiably hesitant to offer a grant-funded research positions to a student whose work they have not observed. Our experience is that international students rarely will come to the US without the promise of funding in the first semester. In light of the difficulty of matriculating international students and because domestic students often are better prepared for a quick start to thesis research, attracting domestic applicants with the skills needed to succeed in graduate school is essential to maintaining a dynamic graduate program with a critical mass of students. We do well in attracting WSU undergraduates, but attracting domestic students from other universities is essential to providing intellectual diversity. Here recruiting by individual faculty with openings in their labs appears to be most effective.

#### ***D. Also address students enrollment, degree production and employment outcomes for diverse students.***

Under-represented minorities are a small, but growing proportion of students in the Biology MS program (mean = 5.3% for FY2018 and FY 2019 (FY2020 and FY2021 data not provided)). FY 2019 had our greatest percentage of under-represented minorities in the Biology MS program (10.5%) among years for which data was provided (since FY 2013). This representation is less than across Masters programs in the College of Liberal Arts and Sciences where 11.9% of students are under-represented minorities. Under-represented minorities achieve success in the Biology MS program as they constitute, on average, 5.6% of degrees conferred FY 2018-2020, matching their representation in the program. Although the sample size is small, it would appear that employment outcomes for under-represented minorities are similar to all our graduates. Currently, one latinx recent graduate is a wildlife biologist / land steward with California State Parks and a current African-American graduate student has been accepted into multiple Biology PhD programs.



## Part 5: Program Service

*Analyze the service the Program/certificate provides to the discipline, other programs at the University, and beyond. Complete for each program if appropriate. Data tables 1, 2, 3 and 5a, b and c provided by the Office of Planning Analysis (covering SCH by FY and fall census day, instructional faculty; instructional FTE employed; program majors; and degree production) can be used to partially address this section. (Refer to instructions in the WSU Program Review document for more information on completing this section).*

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### ***A. Provide a brief assessment of the service the Program provides using SCH by majors and non-majors.***

UNDERGRADUATE AND MASTER OF SCIENCE GRADUATE PROGRAM: For FY 2018 - FY 2020, student credit hour production by the Biology Department averaged 11,926. This included the two highest years of student credit hour production (2018, 2019) since 2014, which was the start of the provided data. Through their roles as graduate teaching assistants who instruct lab sections, graduate students in the Biology MS program are essential to many high-enrollment courses that serve Biology majors as well as majors from other programs. Our graduate students make possible laboratories in Human Organism (Bio 106, lab Bio 107), General Biology I (Bio 210), General Biology II (Bio 211), General Ecology (Bio 418), Genetics (Bio 419) and Molecular Cell Biology (Bio 420). These labs provide applied, experiential learning, a central initiative of the WSU Strategic Plan. Without these lab experiences, the value of these courses for Biology majors and majors from other programs would be vastly diminished. Students would lack experience with 'hands-on' skills that make them more marketable job candidates and their ability to understand and appreciate knowledge developed through the scientific method would be stunted.

### ***B. Provide a brief assessment of the service the Program/certificate provides to other university programs.***

In FY 2018 and FY 2019, 70.7% on average, of the credit hours produced by the Biology department were attributable to non-program majors. Therefore, courses taught in the Biology department are critically needed by other programs on campus.

### ***C. Provide a brief assessment of the service the Program/Certificate provides to the institution and beyond.***

Graduate education represents a synergistic interaction of the research and teaching functions of our department. Graduate students learn by "apprenticing" in faculty members' research programs. However, they also make possible faculty research programs, including externally-funded research, by working as research assistants and by addressing pieces of a lab's larger research agenda in their theses. Preliminary data generated from graduate student research often is critical to successful grant proposals. This is a process with widespread benefits; the graduate student and faculty mentor who generated the data get peer-reviewed publications, future graduate students benefit from funding to the faculty member's lab, and the university receives indirect costs. During this evaluation period, Biology faculty administered grants worth >\$13 million, awarded during this and previous review cycles. Receiving this funding and successfully completing funded projects depends on the collaboration of faculty mentors and motivated, well-prepared graduate students.

Biology graduate students and graduate faculty are extensively involved in outreach in the Wichita community. Graduate students regularly judge high school student presentations at Science Olympiad and Kansas Junior Academy of Science annual meetings. Graduate students participate in outreach activities, such as Expanding Your Horizons, that bring Wichita-area students from under-represented groups in science to the WSU campus. This has benefits for the students who participate and for recruiting students to WSU. Further, graduate faculty and students provide consultation for the public, media, and state agencies.

## Part 6: Impact of Previous Self-Study Recommendations

*At the conclusion of the last program self-study performed, the committee provided recommendations for improvement for the department. Please list those recommendations and note your progress to date on implementation.*

### Committee Recommendation from last review?

☐ Forward Facing Goals Accepted    ☐ Forward Facing Goals Resubmitted (Date \_\_\_\_\_)

Internal Follow-up Recommendation:

☐ 2-year Follow-Up    ☐ NA

KBOR Recommendation:

☐ Enhanced    ☐ Maintained    ☐ Monitored for improvement    ☐ Discontinued

**Complete the table.**

*Table 6 Changes made based on Previous Recommendations*

Recommendation	Activity	Outcome
<i>Biology MS program</i>		
More course offerings	Successfully executed a search for one new faculty member. A second search generated three strong candidates and negotiations with a top-candidate are on-going	New faculty member teaches four new upper-level courses, three of which include labs, in the areas of vertebrate and aquatic ecology and evolution. These courses are in high demand.
Continue to recruit under-represented groups	Be cognizant of the value of diversity in attracting students to labs for undergraduate research, which is an important tool for recruiting graduate students. Be cognizant of the need for additional support and interaction to retain students who may feel different from many members of the department.	Representation of under-represented groups in the Biology MS program fluctuated during the evaluation period. However, in spring 2022 representation of under-represented minorities (22.2% (4/18)) is higher than it has been since 2013, the start of data provided to us.

## Part 7: Program Forward-Facing Goals from Last Review

*Report on the Program's/certificate'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).*

**Complete the table.**

*Table 7 Results of Goals from Last Review for the Biology MS program*

(For Last 4 FYs)	Goal(s)	Assessment Data Analyzed	Outcome	Status (Continue, Replace, Complete)
	Integrate at least two new faculty members (one EEO and one biomedical) into the Biology graduate program.	Count of new graduate faculty in Biology	Not successfully met. One new faculty member (EEO) was hired into the Biology Department during the review period.	
	Maintain an active MS graduate program that consistently includes >20 students.	Counts of MS program students enrolled per year	Not successfully met. We maintained an average of 1-2 students per faculty, but the total number of students varied between 16 and 19 during the evaluation period.	
	Graduate a minimum of 5 students from our MS program per year.	Counts of MS program graduates per year	Successfully met. Mean graduates per year = 8, range = 6 - 11	
	Maintain a diverse applicant pool that includes international students, domestic WSU students and domestic students from other undergraduate institutions. Increase applications and enrollment by students from under-represented groups in science.	Percentage of under-represented groups in Biology MS program; counts of under-represented groups in MS program	Currently successfully met. Since fall 2020 we have had 3 or 4 graduate students from under-represented groups constituting 15% - 25% of our graduate student population. Representation of under-represented groups, however, has fluctuated substantially.	

## Part 8: Forward-facing Goals

Identify goal(s) for the Program to accomplish in time for the next review. Goals must be **Specific, Measurable, Attainable, Realistic and Time-bound (SMART)** and should be tied to the university and college strategic plans.

Complete the table.

Table 8 Forward Facing Goals for Program Review Period

Program/Certificate Goal	Specific	Measurable	Attainable	Realistic	Time-bound
<i>Ex. To improve student learning outcomes (exam scores) by supporting Supplemental Instruction from four sections to seven by fall 2020.</i>	Yes – Exam Scores	Yes – How many sections.	Yes – budget approved. Discussed with OSS.	Yes – Within the scope of responsibility.	Yes – Fall 2020
Improve overall D/F/W rate in Biol 210 and Biol 211	Yes-final grades	Yes- each semester there are 3 section of these courses taught by multiple instructors. Allows evaluation of Biol 210 to Biol 211 and between different faculty.	Yes-Biol 211 faculty began spring 2022 (more biology' majors enroll in Biol 211 than Biol 210) to determine best practice to maintain rigor with this course.	Yes, implementation of new practices for fall 2022 in Biol 211 will allow data to determine when/if an approach has been successful.	Yes, implement in fall 2022 and beyond until D/F/W rate has improved by 5%. As best practices are determined, they will be evaluated in Biol 210.
Raise enrollment in the MS program so that it consistently includes >20 students.	Yes, defined in previous column	Counts of graduate students enrolled in MS program at start of each semester	Yes – we accomplished this FY 2014 – FY 2017	Yes – but lingering effects of Covid-19 pandemic present challenges	Yes – fall 2023
Maintain levels of enrollment in the MS program by students from under-represented racial / ethnic groups in science at $\geq 10\%$ of our graduate students.	Yes, defined in previous column	Counts of students who identify as from under-represented racial / ethnic groups in science as defined by the National	Yes – with being cognizant of the goal in engaging undergraduates in research and in selecting departmental seminar speakers who	Yes – we have raised enrollment above this level. We need to employ the same strategies to keep it there	Yes – fall 2022 and moving forward



		Science Foundation.	can provide examples		
Increase professional preparation (professionalism) training opportunities within the Biology Department for our graduate students, including preparing a CV, writing a cover letter, stating your 'elevator pitch' for your research.	Yes, defined in previous column	Track frequency of positive vs. negative written comments concerning professionalism training in MS program exit surveys	Yes – graduate student lunches on weeks with no external seminar speaker provide an existing venue as does our departmental grad student orientation at the start of each semester.	Yes – but it would be more realistic with more faculty and staff hired in Biology	Yes – start in fall 2022 and grow as resources allow.

## Provide any additional narrative covering areas not yet addressed.

### *Need for Increased Resources*

Adequate faculty numbers are critical to maintaining faculty productivity as well as a large, intellectually-engaged graduate student community. Currently, we have 11 tenured or tenure-track faculty, the same number of tenure-track faculty that we had in the early 2000s. This is the least among our peer institutions, representing only 70% of the faculty of the next smallest Biology Department (see table below). Further, the status of our department is highly concerning in that only one of our faculty is at the assistant professor rank.

Peer Institution	Number of Tenured or Tenure-track Faculty Members in Biology Department
New Mexico State University	21
University of Massachusetts-Lowell	21
University of Nevada-Reno	27
University of North Dakota	18
Wright State University	16

With departmental, college, university, and professional service demands divided among few faculty, inevitably, time for graduate student mentoring and scholarship is challenged. Further, graduate student exit surveys emphasize that students want greater diversity of course offerings and that only can be achieved by hiring faculty whose expertise adds to the breadth of knowledge in our department. We are very pleased by the hiring of Dr. Tom Luhring during this review period. His addition to the Biology Department expanded our course offerings in subjects of high demand by our students, generated a wealth of undergraduate and graduate student research opportunities and resulted in exciting new intramural and extramural research collaborations. We are also excited by the candidates from our recent Developmental Biologist search and we expect one of our top candidates will join the department in fall 2022. Hopefully, these are the first in a series of new faculty hires in Biology.

However, to accommodate a much-needed increase in faculty numbers we need more staff and more space.

Adequate numbers of staff are crucial for meeting the demands of an active department that is administering expanded course offerings and substantial external research awards. Our staff work very hard and do excellent work; but they need more help moving forward. Finally, space to house faculty and staff offices and faculty labs is currently at capacity in the portion of Hubbard Hall allocated to Biology. Additional space must be found to allow the Biology Department to grow.

Graduate teaching assistantships are a critical resource for maintaining a dynamic MS program when federal research funding, that could support graduate research assistantships, is exceedingly competitive. We are grateful for teaching

assistantship funding that allows us to mentor graduate students with whom we can produce data for future grant proposals and that provides crucial support for our undergraduate teaching and research laboratories. Our ability to maintain those laboratory activities supports our program, but also has far-reaching advantages for the university because they provide key academic requirements (service courses needed by many other departments/colleges). Further, if we are to enroll qualified international applicants, non-instructional funding opportunities must also increase because these students often require funding and do not have the English proficiency to teach in their first semester.

Increases in graduate teaching assistantship salaries to levels that are competitive with regional research universities are urgently needed. Our GTAs earn \$11,000 per academic year plus a tuition waiver. This is much closer to assistantship salaries at the non-research institutions KBOR institutions (Emporia State, Pittsburg State and Fort Hays State) than to our fellow research institutions (University of Kansas and Kansas State University). Academic year salaries at the non-research institutions range from approximately \$7,000.00 - \$10,500.00. Whereas in the Department of Biology at Kansas State the assistantship salary, for both MS and PhD students, is \$27,300 and in the Department of Molecular Biosciences at University of Kansas that salary for all graduate students is \$25,081 plus tuition waiver. Some institutions offer health insurance as well. Applicants recognize the extreme difficulty of living on the assistantship salary that we offer. With these disparities in salaries, however, attracting applicants is difficult. WSU mentors a diverse group of STENI students who are more likely to be economically disadvantaged than those who attend R1 institutions. Raising graduate assistantship salaries will assist with equity, diversity, and inclusion across the state as well as STENI recruitment post-graduation within Kansas.

## APPENDIX

### UNDERGRADUATE PROGRAM

1. Information for Incoming Biology Students (28-33)
2. Graduating Senior Exit Survey (34)
3. New Qualtrics Graduating Senior Survey (35-38)

### MASTERS PROGRAM

1. MS Exit Survey (39-41)
  2. Evaluation Rubric for Thesis Defense (42-44)
  3. Seminar Evaluation Form (45)
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## INFORMATION FOR INCOMING BIOLOGY STUDENTS

Welcome to the Department of Biological Sciences and ShockerNation!

Below you will find general information about biology and the university. Page 3 begins biology specific courses and options for degrees. The first question asked during an initial visit or advising appointment is “What do you plan to do when you graduate?” This drives the entire academic process, as well as determining what you need in your “biological” toolbox. Biology techniques change rapidly, so please explore the information below and then see biology advisors for specific information (contact information below).

### **BIOLOGICAL SCIENCES**-Undergraduate resources:

**Advising:** see a biology advisor or LAS advisor ([LAS.advisor@wichita.edu](mailto:LAS.advisor@wichita.edu) or 316-978-3700) for additional information. There are many rules that must be followed and seeking assistance from an advisor will help you avoid pitfalls.

Biological Sciences advisor:
Maria Martino, MS <a href="mailto:maria.martino@wichita.edu">maria.martino@wichita.edu</a> 537 Hubbard Hall 316-978-6081

**What can I do with a biology degree?** --Today is the time to explore career options and professional societies for additional information to be a competitive applicant for post-baccalaureate careers or education. Look at job listings to determine what current tools are essential. Do not wait till you graduate!

<http://www.bls.gov/ooh/home.htm>

**Research**-Faculty research information including research interests and contact information are available at the link below. You must have a faculty research mentor and complete the enrollment form to enroll in Biol 499 or Biol 669. Spaces fill quickly, so start the process as early as you can. Posters about faculty research are in the hallway near the offices.

<http://webs.wichita.edu/?u=bioscience&p=/research/fsrindex/>

**Scholarships-Department and LAS**-Applications are normally available in November and are due by February of the following year. Awards are made in early April. Also look here for other awards that may be available.

<http://webs.wichita.edu/?u=bioscience&p=/scholarships/sindex>

**GENERAL EDUCATION**-courses required for all students to complete a degree (different colleges may have specific required courses that also fulfill general education—see an advisor for assistance).

<https://www.wichita.edu/academics/generaleducation/>



## **GRADUATE DEGREE PROGRAMS**

Options listed below all have minimum GPA requirements, so if you are interested in a degree beyond a bachelors, you must investigate early to determine how best to be a successful candidate. Also, check requirements at the schools you are interested in attending.

**Premedical**-Interested in attending dental, medical, optometry, pharmacy, or veterinary school? Premedical advisors are in LAS Advising.  
<http://webs.wichita.edu/?u=premedadvising&p=/index>

**Health Professions**- [https://www.wichita.edu/academics/health\\_professions/health\\_professions.php](https://www.wichita.edu/academics/health_professions/health_professions.php)

**Masters/PhD**-master of science program WSU.  
<http://webs.wichita.edu/?u=bioscience&p=/academics/mdindex>

## **REGISTRAR'S OFFICE**

**Registration Links**-Look here for the schedule of courses and the semester calendar for important information.  
<http://www.wichita.edu/thisis/home/?u=registrar>

**Waitlist Information**- If a class is closed and has a waitlist, please be sure to get on the waitlist! We monitor waitlists daily and add additional sections when we can.  
<http://webs.wichita.edu/?u=registrar&p=/waitlisting/>

**STUDENT SUCCESS**-assistance in maximizing time spent with academics and personal goals.  
<http://www.wichita.edu/thisis/home/?u=ofdss>

CHECK OUT OUR FACEBOOK PAGE [@BIOWSU](#) We post internships, opportunities, fun facts on this site.

Visit [Wichita.edu](http://Wichita.edu) and search for information not listed here. <https://www.wichita.edu/>

## BIOLOGICAL SCIENCES—DEGREE CHECKSHEET—all degrees listed

### ALL STUDENTS SHOULD MEET WITH AN LAS ADVISOR TO ENSURE COMPLIANCE WITH ALL COLLEGE AND UNIVERSITY REQUIREMENTS

At least 120 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 the College of Liberal Arts and Sciences and General Education. A senior form and an AFD (application for degree) completed prior to the semester you intend to graduate. Contact LAS advising to begin the process to complete your senior form, 316-978-3700.

#### Core Biology Courses (7 courses)

- 210 General Biology I (4)
- 211 General Biology II (4)
- 418 General Ecology (4)
- 419 Genetics (4)
- 420 Molecular Cell Biology (4)
- 497 Biology Colloquium (1)

OR

- 499 Undergraduate Research (2) - (Student must obtain a faculty member before enrollment is approved)

AND

#### One course from the following:

- 330 General Microbiology (5)
- 502 Vascular Plants (4)
- 503 Field Botany (4)
- 524 Vertebrate Zoology (4)
- 528 Parasitology (4)

AND

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

### DEGREE AND CONCENTRATION OPTIONS (CHOOSE ONE)

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
-Chem 211-General Chemistry I (5)	-Chem 211-General Chemistry I (5)	-Chem 211-General Chemistry I (5)	-Chem 211-General Chemistry I (5)
-Chem 212-General Chemistry II (5)	-Chem 212-General Chemistry II (5)	-Chem 212-General Chemistry II (5)	-Chem 212-General Chemistry II (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)			
<b>TOTAL HOURS = 70</b>	<b>TOTAL HOURS = 70</b>	<b>TOTAL HOURS =50</b>	<b>TOTAL HOURS = 50</b>
+ C661 chem minor-pre-med requirement		AND FOREIGN LANGUAGE REQUIREMENT	AND FOREIGN LANGUAGE REQUIREMENT

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)	General Biology I	Biol 210 (4)	General Biology I	Biol 210 (4)	General Biology I	Biol 210 (4)	General Biology I	Biol 499 (2-4)	Research (arranged)
Biol 211 (4)	General Biology II	Biol 211 (4)	General Biology II	Biol 211 (4)	General Biology II	Biol 211 (4)	General Biology II	Biol 503(4)*	Field Botany
Biol 330 (5) *	General Microbiology	Biol 330 (5) *	General Microbiology	Biol 330 (5)*	General Microbiology	Biol 330 (5) *	General Microbiology	Biol 640CC (4)*	Field Desert Ecology
Biol 418 (4)	Ecology	Biol 420 (4)	Molecular Cell Biology	Biol 418 (4)	Ecology	Biol 420 (4)	Molecular Cell Biology	Biol 640CB (4)*	Field Vertebrate Biology
Biol 419 (4)	Genetics	Biol 497 (1)	Colloquium	Biol 419 (4)	Genetics	Biol 497(1)	Colloquium		
Biol 497 (1)	Colloquium	Biol 499 (2-4)	Research (arranged)	Biol 497 (1)	Colloquium	Biol 499 (2-4)	Research (arranged)		
Biol 499 (2-4)	Research (arranged)	Biol 530 (3) *	Applied/Enviro Microbiology	Biol 499 (2-4)	Research (arranged)	Biol 524 (4)	Vertebrate Zoology w/lab		
Biol 502 (4)*	Vascular Plants	Biol 534 (3)	Human Physiology	Biol 532 (4) *	Entomology	Biol 534 (3)	Human Physiology		
Biol 524 (4)*	Vertebrate Zoology w/ lab	Biol 535 (2)	Human Physiology Lab	Biol 560 (2) *	Plant Ecology	Biol 535 (2)	Human Physiology Lab		
Biol 527 (5)	Comparative Anatomy	Biol 590 (3)	Immunology	Biol 561 (2) *	Plant Ecology Lab	Biol 590 (3)	Immunology		
Biol 540 (4) *	Developmental Biology	Biol 510 (3) *	Ecological Management Restoration	Biol 640AB (3)	Human Anatomy	Biol 640P(3) *	Evolution		
Biol 570 (3) *	Conservation	Biol 528(4)*	Parasitology	Biol 640AL(2)	Human Anatomy Lab	Biol 661 (3)	Pathogenic Microbiology		
Biol 640G (3)	Neurobiology	Biol 640CA (3)*	Herpetology	Biol 640AC (3)	Endocrinology	Biol 767 (3)	Mechanisms of Hormone Action		
Biol 710 (3)	Glycobiology	Biol 640CL(1)*	Herpetology Lab	Biol 640G (3)	Neurobiology	Biol 737 (3) *	Biostatistics		
Biol 725 (3) *	Biodiversity Analysis	Biol 626 (3)	Reproductive Biology	Biol 662 (3)	Virology	Biol 780 (3)	Molecular Genetics		
Biol 740I (3)	Experimental Design	Biol 738 (3)*	Plant/Animal Interactions	Biol 666B/ Biol 730 (3)	Topics in Biochemistry: Cancer Biology	Biol 797 (1)	Seminar		
Biol 797 (1)	Seminar	Biol 760 (4)	Experimental Molecular Biology	Biol 740D (3)	Computing for Biologists (3)				
		Biol 797 (1)	Seminar	Biol 797 (1)	Seminar				
COURSE ROTATION FOR ADDITIONAL COURSES NEEDED FOR BIOLOGY MAJORS									
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

Chem 211 (5)	General Chemistry I	Chem 211 (5)	General Chemistry I	Chem 211 (5)	General Chemistry I	Chem 211 (5)	General Chemistry I	Chem 211 (5)	General Chemistry I
Chem 212 (5)	General Chemistry II	Chem 212 (5)	General Chemistry II	Chem 212 (5)	General Chemistry II	Chem 212 (5)	General Chemistry II	Chem 212 (5)	General Chemistry II
Chem 523 (4)	Analytical Chemistry			Chem 523 (4)	Analytical Chemistry				
Chem 531 (5)	Organic I	Chem 531 (5)	Organic I	Chem 531 (5)	Organic I	Chem 531 (5)	Organic I	Chem 531 (5)	Organic I
Chem 532 (5)	Organic II	Chem 532 (5)	Organic II	Chem 532 (5)	Organic II	Chem 532 (5)	Organic II	Chem 532 (5)	Organic II
Chem 661 (3)	Intro Biochemistry	Chem 661 (3)	Intro Biochemistry	Chem 661 (3)	Intro Biochemistry	Chem 661 (3)	Intro Biochemistry		
Chem 662 (3)	Biochemistry I	Chem 663 Chem 664	Biochemistry II Biochemistry Lab	Chem 662 (3)	Biochemistry I	Chem 663 Chem 664	Biochemistry II Biochemistry Lab		
Chem 666 (3)	Special Topics in Biochem								
Phys 213 (5)	General College Physics I	Phys 213 (5)	General College Physics I	Phys 213 (5)	General College Physics I	Phys 213 (5)	General College Physics I	Phys 213 (5)	General College Physics I
Phys 214 (5)	General College Physics II	Phys 214 (5)	General College Physics II	Phys 214 (5)	General College Physics II	Phys 214 (5)	General College Physics II		

**COURSE ROTATION FOR ALL BIOLOGY MAJOR LEVEL COURSES AND ADDITIONAL SCIENCES Spring 2022-SUBJECT TO CHANGE WITHOUT NOTICE**  
**\*APPROVED EEO ELECTIVES**

LOG INTO YOUR MYWSU TO VIEW YOUR DEGREE AUDIT WITH A SEMESTER-BY-SEMESTER PLAN TO GRADUATION (STUDENT MUST MEET WITH BIOLOGICAL SCIENCES ADVISOR TO ESTABLISH AN INDIVIDUAL PLAN).

**MAJOR LEVEL BIOLOGY ELECTIVES COURSE DESCRIPTIONS**

**<https://www.facebook.com/biowsu/>**

**Check out our Facebook page for information and opportunities!**



**FIELD MAJOR IN BIOCHEMISTRY****Bachelor of Science (BS)****(Biology) A12T (Chemistry) A13T**

At least 120 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.**

<b>SEMESTER OFFERED</b>	<b>COURSE NUMBER</b>	<b>COURSE NAME</b>
ALL	CHEM 211	General Chemistry I (5)
ALL	CHEM 212	General Chemistry II (5)
ALL	CHEM 531	Organic Chemistry I (5)
ALL	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)
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 <b>Either both</b>	MATH 111	College Algebra (3)
ALL <b>and</b>	MATH 123	College Trigonometry (3)
ALL <b>Or</b>	MATH 112	Pre-calculus Mathematics (5) (or equivalent)
ALL	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 chosen from the following:

FL	CHEM 514	Inorganic Chemistry (3)
SP	CHEM 524	Instrumental Methods of Chemical Analysis (4)
FL	CHEM 545	Physical Chemistry I (3)
SP	CHEM 546	Physical Chemistry II (3)
FL	CHEM 605	Medicinal Chemistry (3)
FL & SP EVEN	BIOL 330	General Microbiology (5)
SP	BIOL 534-535	Human Physiology (3) and Laboratory (2)
FALL EVEN	BIOL 540	Developmental Biology (4)
SP	BIOL 590	Immunobiology (3)
SP ODD	BIOL 626	Reproductive Biology (3)
FALL ODD	BIOL 640AC	Endocrinology (3)
SPRING EVEN	BIOL 640P	Evolution (3)
SPRING EVEN	BIOL 661	Pathogenic Microbiology (3)
FALL ODD	BIOL 662	Virology (3)
FALL EVEN	BIOL 710	Glycobiology (3)
FALL ODD	BIOL 730	Cancer Biology (3)
SP ODD	BIOL 760	Experimental Molecular Biology (4)
SPRING EVEN	BIOL 767	Mechanism of Hormone Action (3)
SP EVEN	BIOL 780	Molecular Genetics (3)
ALL	MATH 242	Calculus I (5)
ALL	MATH 243	Calculus II (5)
AL	MATH 344	Calculus III (3)

GRADUATING SENIOR QUESTIONNAIRE  
Biological Sciences

---

Place a mark in the diamond in front of the statement that best answers the following questions. Your comments will help future WSU biology students, so please provide constructive criticism so we can improve the program. Thanks!

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? If you rate this below fair, please indicate what you did to get into a lab.

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

COMMENTS:

7. Where were you advised? What was your advisors name? Please comment on areas that could be improved!

☐ LAS   ☐ Biology   ☐ Self-advised   ☐ Advisor \_\_\_\_\_

COMMENTS:

DATE: \_\_\_\_\_ NAME (optional) \_\_\_\_\_



Use the buttons at the right to choose the option that best matches your opinion in relation to the following prompts.

	Strongly Agree	Somewhat Agree	Agree	Somewhat Disagree	Strongly Disagree
1. I believe I got a good education in Biology.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. If I had it to do over, I would major in Biology at WSU.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. The overall atmosphere of the department (faculty, teaching assistants, office staff, etc.) is helpful and conducive to learning and scholarship.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. I feel that WSU Biology prepared me well for the next step in my career/education.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. The facilities at WSU Biology were reasonably updated and adequate for my educational and research needs.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Feel free to provide more detailed feedback about any of your answers to the statements above. Please indicate which statement you are referencing by its number.

Would you like to highlight a particular faculty member as influencing you favorably in some way or, as an unusually good teacher?

- ☐ Yes
- ☐ No



Use the space below to share your positive experiences with a faculty member from WSU Biology.

Do you have any additional feedback (positive or negative) regarding department's curriculum or the education you received from WSU Biology?

- ☐ Yes  
☐ No

Please provide any feedback regarding the WSU Biology's curriculum. Feel free to note particular people, events, strategies or opportunities that were helpful or areas that need improvement.

How would you rate the undergraduate research opportunities available in the department?

- ☐ Far above average  
☐ Somewhat above average  
☐ Average  
☐ Somewhat below average  
☐ Far below average

Do you have any additional feedback (positive or negative) regarding WSU Biology's undergraduate research opportunities?

- ☐ Yes  
☐ No

Please provide any feedback regarding the WSU Biology's undergraduate research opportunities. Feel free to note particular people, events, strategies or opportunities that were helpful or areas that need improvement.



.....  
Did you meet with a Biology advisor who set up a plan in Degree Works? .....

- ☐ Yes  
☐ No



.....  
In the instances when you were unable to take your preferred/required courses, were appropriate substitutions offered? .....

- ☐ Yes  
☐ Maybe  
☐ No

Where were you advised? Choose all that apply. ....

- ☐ LAS  
☐ Biology  
☐ Self-advised



.....  
How often were you able to take the courses you wanted and/or needed in the appropriate semester? .....

- ☐ Always  
☐ Most of the time  
☐ About half the time  
☐ Sometimes  
☐ Never



.....  
What was your advisor's name? .....

.....  
Do you have any additional feedback (positive or negative) regarding department's undergraduate advising? .....

- ☐ Yes  
☐ No



.....

Please provide any feedback regarding the WSU Biology's advising. Feel free to note particular people, events, strategies or opportunities that were helpful or areas that need improvement.

.....



.....

Do you have a job or significant job prospect upon graduating, or have you been accepted into a program for further education (graduate school, professional school, etc.)?

.....

- ☐ Yes
- ☐ Maybe
- ☐ No



.....

Would you please provide the name of the potential employer/school, or the type of employer/school?

.....



**BioShocker!!**

Thank you so much for your time in completing this survey. We truly hope we've served you well and wish you the best of luck in your future endeavors.



**WICHITA STATE  
UNIVERSITY**

**FAIRMOUNT COLLEGE OF  
LIBERAL ARTS AND SCIENCES**

*Department of Biological Sciences*

## 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.  $\leq 2$     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 return completed survey to Leland Russell (leland.russell@wichita.edu)**

# 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-weighted 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**



Evaluator: [Redacted] (PRINT Your name)

Speaker: Alex Date: April 1<sup>st</sup> 2019

Topic: Bees!! + CRP  
Please evaluate the following based upon your level of agreement: 1 (strongly disagree) to 5 (strongly agree)

- 4:01 -
- The speaker provided adequate background that allowed me to understand the topic. very good. When time allows, info on bee biology is good include 1 2 3 4 5
  - The speaker provided a specific hypothesis or idea to be tested. you don't a great job making methods clear in a short time 1 2 3 4 5
  - Experimental methods sufficiently tested the speaker's hypothesis. 1 2 3 4 5
  - The speaker provided a summary/conclusion of the experimental results relating to the hypothesis. I like how you lead the audience thru X & Y axes 1 2 3 4 5
  - You know your stats + results like the back of your hand. The speaker provided useful, instructive slides. 1 2 3 4 5
  - Intuiting, clear, good. The speaker spoke clearly and was easy to understand. 1 2 3 4 5
  - very good cadence + enunciation. Volume good, too! 1 2 3 4 5
  - The speaker adequately addressed questions. Just Iowa question! When expanding questions sometimes it is good to affirm redundancy, but is a good point... etc. 1 2 3 4 5
  - The speaker utilizes the presentation time effectively. you have your script DOWN, especially into. This will be great 1 2 3 4 5
  - Before the presentation, I was interested in the research topic. moving into your ESA talk defense - oh, boy! 1 2 3 4 5
  - After the presentation, I was interested in the research topic. (the speaker made the topic interesting by virtue of the presentation) 1 2 3 4 5

*you didn't even look at your "security" cards!*

- Over-all, how would you rate the presentation? Circle one  
Poor (1) Fair (2) Good (3) Very Good (4) Outstanding (5)
- Provide comments clarifying your ratings and any specific recommendations for improving the speaker's presentation style or research methods.

*see above*

- Note at least one hypothesis or specific research goal outlined by the speaker. If one was not clearly stated, suggest one based on their presentation.

*all OK!*

- What is the most interesting/impressive aspect of the presentation/speaker?

*Bees!!*

- If you asked the speaker a question, summarize the question AND the speaker's response on the back.