



**WICHITA STATE  
UNIVERSITY**

Program Review Self-Study Template

Academic unit: Biological Sciences

College: Fairmount College of Liberal Arts and Sciences \_\_\_\_\_

Date of last review August 2015 \_\_\_\_\_

Date of last accreditation report (if relevant) \_\_\_\_\_

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): \_\_\_\_\_

Faculty of the academic unit (add lines as necessary)

Name	Signature
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James Beck, assistant professor _____	_____
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George Bousfield, professor _____	_____
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William Hendry, chair and professor _____	_____
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Gregory Houseman, associate professor _____	_____
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Mary Liz Jameson, associate professor _____	_____
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J. David McDonald, professor _____	_____
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F. Leland Russell, associate professor and graduate coordinator _____	_____
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Mark Schneegurt, professor _____	_____
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Joe Shellhammer, fairmount lecturer _____	_____
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Bin Shuai, associate professor _____	_____
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Li Yao, associate professor _____	_____
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Christopher Rogers, professor (permanent disability January 2017)

Donald Distler, associate professor (deceased June 2017)

Submitted by: William J. Hendry, professor and chair \_\_\_\_\_ Date \_\_\_\_\_

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

a. University Mission:

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

b. Program Mission (if more than one program, list each mission):

**UNDERGRADUATE PROGRAM**—The Department of Biological Sciences is committed to providing high-quality teaching for both undergraduate and graduate students and a scholarship source for the university and the Wichita community. This contribution is strongly enhanced by the active scientific research programs conducted by our faculty. Those teaching and research agendas include a balance of both organismal/ecology and cell/molecular activities.

**MASTER OF SCIENCE GRADUATE PROGRAM** --The mission 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.

c. The role of the program (s) and relationship to the University mission: Explain in 1-2 concise paragraphs.

**UNDERGRADUATE PROGRAM**—The Department of Biological Sciences supports the university mission by offering a comprehensive core curriculum preparing our students for careers in research, environmental studies, medicine, and other post-baccalaureate studies. A student's long-term goals are taken into consideration when he/she confers with an advisor to choose between the research and seminar options of the core program as well as select major elective courses. Also, we participate in the Watkins Program along with the department of chemistry, geology, and physics. We also assist the outreach mission of the Fairmount Center for Math and Science education by participating in the state Science Olympiad competition, and the Kansas Junior Academy of Science; all activities that focus on science and math education for middle and high school students both locally and statewide. We provide lab space and needed support to the Upward Bound Math Science TRIO summer programs. Additionally, we participate in EYH (Expanding Your Horizons), a STEM program for middle school girls, provide tours of our department and presentations for middle and high school students, as well as presenting for DNA days and other STEM outreach activities to schools in the area. Annually, we host one of four Watkins Visiting Professors and we recruit area teachers from Kansas middle, high school, community and 4-year colleges for Watkins Summer Fellowships. All department seminars are advertised and open to the public to allow interactions among scientist and community members. Our field station sites (Ninnescah, Sellers, Gerber Reserves, and the newly acquired 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 demonstrate environmental principles and concerns.

**MASTER OF SCIENCE GRADUATE PROGRAM** --A key component of the Wichita State University mission is to serve as an educational, cultural and economic driver for Kansas and the greater public good. The Biology MS program furthers this goal 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 policy debates.

d. Has the mission of the Program (s) changed since last review? ☐ Yes ☒ No

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

No, the Biology Undergraduate Program mission remains the same. We feel our current role and relationship meets the needs of our undergraduate students. While our mission has not changed we continue to assess and monitor student needs and make adjustments as needed.

No, the mission of the Biology MS Program has not changed since the last program review. We do not feel that there is a need to change

our mission currently. Data suggest that the training that we provide our graduate students prepares them well for PhD programs and jobs in industry, government agencies and education.

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

☐ Yes ☒ No

If yes, describe the changes in a concise manner.

**UNDERGRADUATE PROGRAM:** The Department of Biological Sciences is committed to providing high-quality instruction for undergraduate students and a scholarship source for the university and the Wichita community. Our flexible curriculum allows students to choose either a BA or BS degree with concentrations in Biology (general)/Biomedical or Ecological/Environmental/Organismal (degree checksheet appended). All students take the same 5 core courses, and then can choose electives that support their long term goals. In addition, we participate in a BS field major in Biochemistry in partnership with the department of chemistry. We also support secondary science education and the Biomedical engineering programs. All these contributions are strongly enhanced by the active scientific research programs conducted by our faculty and their willingness to recruit undergraduate student participation in such contemporary research. Thus our undergraduate program supports student's endeavors that well prepare them for careers in medicine, environmental studies, education, research and post-baccalaureate studies. 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 last 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 used a multi-faceted approach to evaluating the efficacy of our MS program in meeting our learner-centered objectives. First, we determined the current activities of our graduates using 1) our 'MS graduate student exit survey,' which asks whether the student has been admitted for advanced study or been hired at the time he/she graduates, 2) on-line searches of professional networking sites, and 3) surveys of faculty about the activities of recent graduates from their labs. Second, we evaluated thesis defenses and defenses of capstone projects using a 'learner outcomes' rubric is completed by Biology faculty on the thesis or capstone committee. This rubric indirectly evaluates our learner-centered objectives because it provides information on whether students have obtained the skills and behaviors that are required to follow career paths identified in our objectives. Finally, since our last program review we started 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 and increases the comprehensiveness of our assessment. We implemented this new assessment tool in response to "Needs Going Forward" identified in the last round of program review.

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

#### Learner outcomes

1. Students will be familiar with topical research questions and hypotheses in their field of biology.
2. Students will be able to interpret hypotheses, methods and results presented in primary scientific literature.
3. Students will be able to formulate testable research questions and hypotheses.
4. Students will be able to design and analyze experiments or observational studies that test research questions and hypotheses.
5. Students will acquire the ability to orally communicate scientific research in meeting-style presentations and in seminars.
6. Students will be able to communicate scientific research to other scientists in writing.

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

#### Programmatic Goals

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

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

#### Programmatic Objectives

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

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

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

### Measurement tools for programmatic objectives

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

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

Scholarly Productivity	Number Journal Articles		Number Presentations		Number Conference Proceedings		Performances			Number of Exhibits		Creative Work		No. Books	No. Book Chaps	No. Grants Awarded or Submitted	\$ Grant Value
	Ref	Non-Ref	Ref	Non-Ref	Ref	Non-Ref	*	**	***	Juried	****	Juried	Non-Juried				

Year 1	25	0	45											0		11 awarded	\$1,547,858
Year 2	16	0	34											1		7 awarded	1,466,820
Year 3	15	0	26											0		11 awarded	\$8,824,848

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

\*\*\*\*Commissioned or included in a collection.

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

Provide assessment here:

During this assessment period (FY2015-FY2017) the number of tenure or tenure-track graduate faculty in the Biology Department declined from 11 to 10. The number of tenure or tenure-track faculty who taught undergraduate courses declined from 12 to 10. Data provided in the above table are drawn from faculty activity reports for 2015, 2016 and 2017. The standard mechanisms for disseminating research results in Biology are peer-reviewed journal articles and presentations at professional meetings. Therefore, the small number of books and conference proceedings published as well as performances and exhibits are to be expected.

The Biology MS program and graduate faculty were generally successful in meeting the three programmatic objectives in section 1e. First, we exceeded programmatic objective #1 of maintaining an MS program with an average of 1-2 graduate students per graduate faculty member. In FY 2015, 2016 and 2017, the Biology MS program included 24, 23 and 23 students, respectively. Over this interval, the minimum average number of graduate students per graduate faculty member was 2.09. The graduate program was productive in graduating MS students, graduating 8, 9 and 6 students in 2015, 2016 and 2017, respectively. Second, we exceeded programmatic objective #2 of producing at least one peer-reviewed publication per graduate faculty member per year, producing 2.27, 1.45 and 1.5 peer-reviewed publications per graduate faculty member in 2015, 2016 and 2017, respectively. Biology faculty also produced one textbook, one invention, one peer-reviewed web site and one peer-reviewed mobile app. Third, we came close to meeting programmatic objective #3 of attending at least one national or international conference per year, making presentations at 1.27, 0.8 and 0.7 national or international meetings per graduate faculty member in 2015, 2016 and 2017, respectively.

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 2015-2017, biology faculty performed 107 manuscript peer-reviews for national and international journals, three faculty served as grant review panelists for national funding organizations, two faculty served on editorial boards of international journals and one faculty member edited a book. Biology faculty were awarded >\$11,800,000 in external grants during the evaluation period and continued funded research from previous evaluation periods. These awards are from highly competitive national funding agencies, such as the National Science Foundation and the National Institutes of Health, as well as from less traditional sources, such as Kansas Department of Parks, Wildlife and Tourism and the Kansas Soybean Commission.

Dynamic faculty research programs benefit graduate students. During the evaluation period, graduate students were lead authors or co-authors on 20 peer-reviewed articles. Further, graduate students were lead presenter or co-presenters on 16 presentations at national or international conferences. Our graduates' success in gaining admission to PhD programs (35% of graduates) demonstrates other scientists consider our students to have received excellent training.

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

- a. For undergraduate programs, compare ACT scores of the majors with the University as a whole.

As a whole, the university ACT scores rolling averages for the past 5 years has been 23.0, the ACT scores of biological sciences majors during the same period is 24.1.

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

The average GPA of students admitted to the Biology MS program for FY15-17 was 3.22. 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, perhaps most importantly the nature of applicants undergraduate research experiences, factor significantly into our admission decisions.

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

In the following table provide program level information. You may add an appendix to provide more explanation/details. Definitions:

**Learning Outcomes:** Learning outcomes are statements that describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors students acquire in their matriculation through the program (e.g., graduates will demonstrate advanced writing ability).

**Assessment Tool:** One or more tools to identify, collect, and prepare data to evaluate the achievement of learning outcomes (e.g., a writing project evaluated by a rubric).

**Criterion/Target:** Percentage of program students expected to achieve the desired outcome for demonstrating program effectiveness (e.g., 90% of the students will demonstrate satisfactory performance on a writing project).

**Result:** Actual achievement on each learning outcome measurement (e.g., 95%).

**Analysis:** Determines the extent to which learning outcomes are being achieved and leads to decisions and actions to improve the program. The analysis and evaluation should align with specific learning outcome and consider whether the measurement and/or criteria/target remain a valid indicator of the learning outcome as well as whether the learning outcomes need to be revised.

#### UNDERGRADUATE PROGRAM

Learning Outcomes (most programs will have multiple outcomes)	Assessment Tool (e.g., portfolios, rubrics, exams)	Target/Criteria (desired program level achievement)	Results (WSU seniors: National MFT comparative results)	Analysis
1-Students will develop a broad knowledge of biological concepts.	Students are required to take the ETS Major Field Achievement Test in Biology prior to being certified for graduation	Average of all WSU graduates will be at or above the national mean.	WSUBiosci:National YR 1-151:153 +/-12.9 YR 2-153:153 +/-13 YR 3-153:153 +/-13	Year 1 shows a slight decrease from the nat'l average. This is still within the SD (standard error) and so our students continue to be at or above the mean for the overall score for all 3 years. See subset scores in table 3c below.
2 & 3-Students will develop the intellectual and mechanical skills necessary to conduct biological research. Students will participate in research and scholarly activity through interactions among students, faculty, and other professional biologists in the community.	Biol 497-Colloquium and Biol 499-Undergraduate Research	100% satisfactory grades	Biol 497/Biol 499 enrollment YR 1-45/46 YR 2-51/34 YR 3-55/45 All years at 100% satisfactory grades	YRS 1-3 meets target. While Biol 481-co-op education has not been included in this report, Biol 481 enrollment doubled from year 1 to 2 & 3.
4. Assessment of the program using department survey for graduating seniors.	Graduating senior department survey-attached in appendix	75% of graduating seniors will strongly or somewhat agree they received a good education at WSU.	Year 1-3 n=152 71% strongly or somewhat agree 77% when agree added to total	31% of students who somewhat disagreed or disagreed wish they had changed their major from biology.

Table 3C: MFT EXAM BY SUBSCORE-BIOLOGICAL SCIENCES (WSU) COMPARED TO NATIONAL MFT EXAM RESULTS

WSU: Nat'l average	WSU:NAT'L Mean total	WSU:NAT'L Mean cell biology	WSU:NAT'L Mean molecular biology and genetics	WSU:NAT'L Mean organismal biology	WSU:NAT'L Mean population biology, evolution, and ecology	ANALYSIS
Year 1 n=9,273	151:153	50:53	51:53	53:53	48:52	Slightly lower than the nat'l average for year 1, but within SD. Cell biology and pop bio reduced overall score
Year 2 n=21,334	153:153	52:53	53:53	54:53	52:52	Improvement in year 2 in all categories.
Year 3 n=33,179	153:153	54:53	54:53	53:53	52:52	Maintained increase from year 2.

MASTER OF SCIENCE GRADUATE PROGRAM: Copies of the surveys and evaluation forms that we use as assessment tools are submitted with this report. Results for the 'learner outcomes rubric for MS defenses' are based on 16 completed rubrics and results for the 'MS graduate student exit survey' are based on 17 completed surveys. In addition, we now assess student learning through faculty evaluation of 15 minute student research presentations as part of our departmental seminar series. Because graduate students enroll twice in Departmental Seminar (Bio 797), we can evaluate improvement from the first to the second presentation. We first implemented this assessment tool in spring 2016 and so we only have data for first and second presentations for four students.

Learning Outcomes (most programs will have multiple outcomes)	Assessment Tool (e.g., portfolios, rubrics, exams)	Target/Criteria (desired program level achievement)	Results	Analysis
Students will be familiar with topical research questions and hypotheses in their field of biology.	1. Learner outcomes rubric for MS defenses (completed by Biology faculty other than the advisor on the thesis / capstone committee) 2. MS graduate student exit survey (completed by graduating student) 3. Graduate student departmental seminar presentation evaluations (completed by faculty)	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. Mean = 3.87  2. 76% indicating highest level of confidence with learning objective  3. 75% improved from first to second presentation	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. average score of 3 or 4  2. majority of graduates indicating the highest level of confidence with the learning objective.	1. Mean = 3.81  2. 94 % indicating highest level of confidence with learning objective	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. average score of 3 or 4  2. Improvement from first presentation to	1. Mean = 3.73  2. 100% improved from first to second	Please see analysis at end of table

		second presentation.	presentation	
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. average score of 3 or 4 2. Improvement from first presentation to second presentation.	1. Mean = 3.31 2. 75% improved 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 presentation evaluations	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. Mean = 3.62 2. 82% indicating the highest level of confidence with learning objective 3. 100% improved from first to second presentation	Please see analysis at end of table
Students will be able to communicate scientific research to other scientists in writing.	1. Learner outcomes rubric for MS defenses 2. MS graduate student exit survey	1. average score of 3 or 4 2. majority of graduates indicating the highest level of confidence with the learning objective	1. Mean = 3.13 2. 76% indicating highest level of confidence with learning objective	Please see analysis at end of table

The results from our assessment tools for our six learner outcomes consistently show that graduates are attaining a high level of competency in all of the learner outcomes. It is noteworthy that when students did not feel the highest level of confidence in their attainment of a learning outcome, they always indicated a mid-level of confidence and never low confidence. The exit surveys show students are receiving training in most skills indicated by the learner outcomes through multiple routes. 67% of respondents indicated they had received training in reading primary scientific literature through classes, interactions with their advisor and lab discussion groups. Similarly, 67% of respondents indicated they received training in oral presentation through at least two of the following three routes; classes, lab discussion groups and interactions with their advisor. By contrast, training in scientific writing in our department primarily occurs through interactions with the student's advisor. 67% of graduates report 'interactions with your advisor' as the primary and most useful route through which they received training in scientific writing. Since our use of departmental seminar presentations to evaluate learner outcomes is new and the sample size is quite small (4), it is premature to draw conclusions from its results. Our learner outcome assessment tools show generally we are achieving success in helping our students develop skills they need to succeed as scientists.

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

#### UNDERGRADUATE PROGRAM

Learner Outcomes (e.g., capstone, licensing/certification exam pass-rates) by year, for the last three years				
Year	N (WSU/NAT'L)	Name of Exam	Program Result	National Comparison±
1	48/9,273	ETS-Major Field Test in Biology	151	153
2	58/21,334	ETS-Major Field Test in Biology	153	153
3	66/33,179	ETS-Major Field Test in Biology	153	153

Satisfaction with Program among Undergraduates at End of Program Exit				
YEAR	N	Program (Biology) Result from end of program exit survey: satisfied or	University Result from end of program exit survey (%)	Fairmount College of Liberal Arts & Sciences: satisfied or very satisfied



		very satisfied (%)		(%)
1-FY '15	76	68.4%	80.9	69.9
2-FY '16	63	76.2%	80.7	68.6
3-FY '17	66	69.7%	82.3	67.1

The median score of 4/5 (5=very satisfied) for each year listed above indicates our students continue to benefit from their academics in biological sciences. As a part of the exit exam, we ask students to complete a survey to better understand their needs. Below is a sample of the most common statements by students:

GENERAL: Great department overall, helpful teachers, easily approachable outside of class, research was favorite part of college career

COURSE OFFERINGS: offer courses more frequently, need upper level anatomy, more animal classes, more pre-med focus, need more research and publishing opportunities

FACILITIES: equipment/teaching labs needs to be updated, need biology study room, love the biology computer lab, wi-fi in Hubbard Hall is horrible

MASTER OF SCIENCE GRADUATE PROGRAM Data from "Application for degree" exit surveys show the mean percent of Biology MS program graduates reporting as "satisfied" or "very satisfied" was 91.4% among 29 respondents for FY15-FY17. The percentages at the college and university level were 84.4% and 85%, respectively. Levels of student satisfaction with the Biology MS program have increased over time; for FY2012-FY2014, 78.2% of respondents were "satisfied" or "very satisfied."

Our departmental "MS Graduate Student Exit Survey" asks graduates for recommendations for improving the Biology MS program. 9 of the 17 graduates who completed this survey made suggestions. The table below summarizes and categorizes these recommendations. The most common suggestion is to provide a greater diversity of courses.

<b>Course offerings</b>
"One area lacking may be the diversity of classes available to graduate students, particularly with the fields of ecology and evolution"
"More courses that cover other aspects of biology, such as advanced immunology, protein engineering, animal cell cultures, should be offered"
"More exposure to grant writing"
"It would be nice if there were more class options, though given the small number of grad students maybe this is not feasible"
"I wish there were more stats/coding classes available"
"I do wish there were more opportunities to improve on writing. I wish there was a class geared towards multivariate analysis"
<b>Resources</b>
"Core labs – more advanced equipment to use and instruction in how to use it"
"The department should provide enough lab equipment to every student"
"Limited funding also limits scientific questions that can be asked/answered"
<b>Departmental Graduate Student Activities</b>
"I wish we had a literature review group/club"
"I would like to see speakers from different areas of research during seminars"
"Lab rotation is good for people who are not sure about their major. But, I think, it would be better to join directly to the lab if people are interested in a particular field and if people are sure that they want to go. Otherwise, I feel like it is just a waste of one semester"

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

Outcomes:	Results	
	Majors	Non-Majors
<ul style="list-style-type: none"> <li>○ Have acquired knowledge in the arts, humanities, and natural and social sciences</li> </ul>		

<ul style="list-style-type: none"> <li>○ Think critically and independently</li> <li>○ Write and speak effectively</li> <li>○ Employ analytical reasoning and problem solving techniques</li> </ul>		
NOT CURRENTLY PERFORMED		

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

- f. For programs/departments with concurrent enrollment courses (per KBOR policy), provide the assessment of such courses over the last three years (disaggregated by each year) assures grading standards (e.g., papers, portfolios, quizzes, labs, etc.) course management, instructional delivery, and content meet or exceed those in regular on-campus sections. Provide information here: NA
- g. Indicate whether the program is accredited by a specialty accrediting body including the next review date and concerns from the last review.  
Provide information here: NA
- h. Provide the process the department uses to assure assignment of credit hours (per WSU policy 2.18) to all courses has been reviewed over the last three years.  
Provide information here: The departmental affairs committee regularly monitors course content by reviewing syllabi for courses on a rotating basis. Curriculum change forms are initiated if needed.
- i. Provide a brief assessment of the overall quality of the academic program using the data from 3a – 3e and other information you may collect, including outstanding student work (e.g., outstanding scholarship, inductions into honor organizations, publications, special awards, academic scholarships, student recruitment and retention).  
Provide assessment here:

**UNDERGRADUATE PROGRAM:** The program continues to produce graduates who are prepared to continue with graduate studies or become employed. Based on data provided, our students have a slightly higher than average ACT score and perform at the national mean for the major field test when compared to the other 348 undergraduate programs administering the exam. Despite the low number of faculty and the staggered course rotation, most students continually agree they would repeat their undergraduate experience at WSU. In year 1, 2, and 3 approximately 10 students/year presented their research at the annual University Research and Creative Activity Forum (URCAF) and the annual Kansas IDEA Network for Biomedical Research Excellence KINBRE symposium. Each semester, biology majors are e-mailed by the biology advisor on several occasions, specifically reminding students that biology advising provides a plan to assist the student in determining which “tools” they need to be competitive in the job market or post-baccalaureate degrees. A number of pre-medical students may not seek advice in the department as pre-med advisors are in LAS advising center. Students advised in biology are asked to look for a job today to determine availability, salaries, job requirements, tools necessary, and if an advanced degree is required. All students are encouraged to do undergraduate research.

**MASTER OF SCIENCE GRADUATE PROGRAM:** The quality of the Biology MS program is high. Enrollment exceeds our goal of 1-2 graduate students per faculty member and the program is at capacity. Further, a high proportion of students graduate within 2-2.5 years. Of the 12 students who enrolled in the Biology MS program in the first 1.5 years of this evaluation period (fall 2014 through fall 2015), 11 graduated in <2.5 years. Frequent authorship by graduate students on peer-reviewed publications and on meeting presentations demonstrates they are conducting meaningful research. Further, our graduates’ comments, faculty evaluations of theses and our graduates’ success in finding employment or positions for advanced study all indicate we are succeeding in meeting our objectives and learner outcomes.

**4. 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).**

- a. Evaluate tables 11-15 from the Office of Planning Analysis for number of applicants, admits, and enrollments and percent URM students by student level and degrees conferred.

**UNDERGRADUATE PROGRAM:** Applicants to the university have increased each year for the past 3 years, with a slight increase in under-represented minorities (URM). The program numbers for URM are below the university and college numbers, but the program rolling 5 year average is steady at 14.3%. There was a decrease in year 3 of 2.8% in junior and senior URM compared to freshman and sophomore of the same year. Number of URM graduates was consistent for year 1 and 2, but declined 1.5% in year 3.

MASTER OF SCIENCE GRADUATE PROGRAM: The most apparent trend in the application data for FY2015-2017 is a decrease in the proportion of applicants accepted into the Biology MS program. This likely reflects a change from applicant evaluation solely by the graduate coordinator to evaluation by a committee of 4-5 graduate faculty. We implemented committee evaluation of applications in fall 2014, coinciding with the start of this review cycle. The goal of committee evaluation is to receive feedback on applicants from faculty whose expertise is close to the applicant's area of interest and to provide multiple opinions on applicants' statements of purpose and letters of recommendation. This results in more rigorous evaluation of applicants and fewer applicants admitted, but it allows us to better identify students whose interests match on-going research in the department and who are likely to succeed in the MS program. Since implementing committee review, a higher proportion of admitted applicants have enrolled in the MS program (100% in FY 16 and FY 17) and only three of the 33 students who enrolled during the review interval have dropped out.

Under-represented minorities are a small proportion of the students engaged in graduate education in Biology (mean = 6.5% for FY2015 and FY 2016 (FY2017 data not provided)). This percentage is greater than for Masters programs across the College of Liberal Arts and Sciences (5.5%). It is less than the percentage of under-represented minorities in MS programs across the university (10.5%). Under-represented minorities constituted 5.3% of applicants to the Biology MS program and 7.4% of graduates from the Biology MS program for FY15-17.

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

Employment of Majors* UNDERGRADUATE PROGRAM							
	Average Salary	Employment % In state	Employment % in the field	Employment: % related to the field	Employment: % outside the field	No. pursuing graduate or professional education	Projected growth from BLS** Current year only.
Year 1	\$62,500	100	100	0	0	5	Faster than average growth (10%) @ \$35,000 to \$54,999/year
Year 2	\$38,000	50	50	0	50	3	
Year 3	\$34,000	75	75	0	25	1	

\* May not be collected every year

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

Employment of Majors* -MASTER OF SCIENCE GRADUATE PROGRAM							
	Average Salary	Employment % In state	Employment % in the field	Employment: % related to the field	Employment: % outside the field	No. pursuing graduate or professional education	Projected growth from BLS** Current year only.
Year 1	\$55,103	2 / 7	5 / 7	0 / 7	0 / 7	2	9.2 % (average across all biology-related jobs)
Year 2	\$45,662	2 / 9	5 / 9	0 / 9	0 / 9	4	
Year 3	\$37,488	2 / 4	3 / 4	0 / 4	0 / 4	1	

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

Provide assessment here:

**UNDERGRADUATE PROGRAM:** As an urban university in the largest city in Kansas, we allow traditional and non-traditional students the opportunity to pursue a bachelor's degree. The average graduation rate is 58 students/year, an increase of 7 students/year. Based on student survey response data above, 50% of our students attend professional schools upon graduation. Graduates can expect to find employment, especially if they are willing to move to nearby states. Of the students employed out of state, most are in neighboring states. Most employed students were in the field of biological research or health-related professions; such as pharmacy or optometry technicians. These data show our program is in demand.

**MASTER OF SCIENCE GRADUATE PROGRAM:** Student demand for the Biology MS program is healthy. After very high numbers of applicants in FY14, FY15 and FY16, our applications declined in FY17. However, this number of applicants was still well in excess of our program's capacity, based upon faculty numbers and assistantship funding. A point of emphasis for us is to ensure we obtain applicants who are well-prepared for graduate research in Biology. In 2015, we received funding from the Wichita State Graduate School to contract WSU Video Services to make a video about our MS program, which we have posted on our departmental web page (<http://webs.wichita.edu/?u=bioscience&p=/index/>) and on our Peterson's.com page. Also related to our admission efforts, in fall 2017 we eliminated credit hour requirements in Biology and Chemistry to allow us to attract applicants whose training in Biology involves non-traditional training, like internships or professional experiences, and applicants who may have training in areas of Biology, such as entomology and ecology, where different knowledge of chemistry, math or other supporting fields might be required. This flexible approach to admissions is consistent with practices at research universities in our region.

Employer demand and demand for our graduates by universities offering advanced degrees also 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 20 students who graduated from our MS program during the evaluation period and for whom we could determine current activities, 35% (7 / 20) are in biology-related PhD programs. 30% of our graduates (6 / 20) are research technicians / managers in university labs. 15% of graduates (3 / 20) are employed in industry; two graduates in microbiologist positions and one with an environmental consulting firm. 10% of graduates (2 / 20) are employed in biology education; one as an instructor / lab coordinator at Wichita State and one in a not-for-profit botanical education organization. 5% of graduates (1 / 20) are in biologist positions in government agencies (a USDA entomologist). 5% of graduates (1 / 20) are in internships related to biodiversity conservation. Over-all, graduates from the Biology MS program are succeeding in finding positions for advanced study, in industry, in government agencies and in education.

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

Evaluate table 16 from the Office of Planning Analysis for SCH by student department affiliation on fall census day.

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

Provide assessment here:

**UNDERGRADUATE PROGRAM:** The SCH for majors is about 28%, which is a 1.7% increase since the last review. The average for non-majors courses is about 70% representing a 1% decrease in non-major SCH. We have seen a decrease in our Biol 223-Human Anatomy & Physiology for non-majors after the addition of HS 290-Foundations of Human Anatomy & Physiology and likely these numbers will not be regained. Since many courses in the program have laboratory sections, we have been working on new ways to enhance our online presence for non-majors. Biol 107-Human Organism Lab began an online section in summer 2017. We will hire a permanent lecturer to provide online instruction for general education courses in fall 17.

**MASTER OF SCIENCE GRADUATE PROGRAM:** For FY15-FY17, 68.8% of the credit hours produced by the Biology department were attributable to non-program majors. Therefore, the courses taught in the Biology department are needed by other programs on campus. Biology graduate students are essential to many of these courses that draw students from other WSU programs because they instruct lab sections. Our graduate students make possible laboratories in Human Organism (Bio 106, lab Bio 107), General Biology I (Bio 210), General Biology II (Bio 211), Genetics (Bio 419) and Molecular Cell Biology (Bio 420). Without the experiential learning of labs, the value of these courses for Biology majors and majors from other programs would be vastly diminished.

Mentoring graduate students is 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 these research programs, including externally-funded research, by working as graduate 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 were successful in obtaining >\$11 million in external funding. Receiving this funding and successfully completing funded projects depends 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 for species identification.

**6. 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).**

(For Last 3 FYs)	Goal (s)	Assessment Data Analyzed	Outcome
	Improve their online presence for non-majors courses with or without labs with the development of existing and new courses.	Enrollment information from WSU reporting services	Yr 2 SCH = 225 Yr 3 SCH = 513 Su '17-Sp '18 = 1,215
	Move forward with the proposal to renovate/remodel existing teaching facilities to accommodate more students each semester.	NA	Our plans for expansion of lab space have been financially overwhelming as no funding was allocated through the university. In fall 2017, the department funded the renovation of a storage space into an ecology lab. This lab is expected to be operational as of summer 2018. This will allow for better scheduling of courses and hopefully allow us to expand offerings and/or increase enrollment.

**7. Summary and Recommendations**

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

Provide assessment here:

UNDERGRADUATE PROGRAM: Strengths--1) Faculty, especially research active faculty, has world class expertise in their fields that is shared with students. 2) Faculty, staff, and graduate students provide significant community outreach. 3) Upper division labs taught by faculty. 4) Diverse course offering especially given the small size of our faculty. Weaknesses--1) All core classes are not taught every semester due to the extensive teaching loads plus research commitments of existing faculty.

GOALS FOR UG BIOLOGICAL SCIENCES PROGRAM:

1. Investigate options to offer core biology courses every fall and spring semester with the current faculty available (if possible).

2. Continue renovation efforts for teaching laboratories.

## MASTER OF SCIENCE GRADUATE PROGRAM

### *Performance in comparison to past goals*

In section 2 we reviewed the Biology MS program's success in meeting our programmatic objectives for program size, faculty productivity and faculty professional engagement. In section 3c we provided data that suggest we are successful in achieving our learning outcomes. Here we revisit the five goals in the summary of our FY2012-2014 program review.

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

For FY2015-FY2017, the number of students in the Biology MS program was consistently 23 or greater.

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

We graduated 8, 9 and 6 students from the Biology MS program in FY15, FY16 and FY17, respectively.

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

We have undertaken several initiatives to increase recruitment from regional undergraduate institutions. First, each semester the graduate coordinator wrote letters introducing our program to three colleagues at regional institutions. Second, we produced a recruitment video. Third, external funding success has allowed faculty to advertise graduate student positions, which has attracted students. Collectively, these efforts have increased the balance of domestic and international students in our applicant pool. Domestic applicants increased from 36% in FY14 to an average of 44% across FY15-FY17.

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

For FY15-FY17, 74% of graduates completed of 'MS graduate student exit survey' and faculty completed 'MS thesis defense rubrics' for 69.5% of graduates. These are substantial increases over FY2012-FY2014, when we introduced these assessment tools, when response rates were 23% for 'MS graduate student exit survey' and 50% for 'MS thesis defense rubrics.'

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

The WSU Biological Field Station continued to be a critical resource for research and teaching in ecology and organismal biology in our department. The Gerber Reserve is used in Biology of Vascular Plants (Bio 503), Field Ecology (Bio 575) and Ecosystem Restoration and Management (Bio 610G), all of which have graduate and undergraduate enrollment. Unique aquatic ecosystems at the Gerber and Sellers reserves attract graduate student and faculty researchers from fish ecology labs at Kansas State University, resulting in one publication during the review period, and a second publication with WSU collaborators in review. These aquatic systems are a major reason why we seek to hire a vertebrate biologist who works in aquatic ecosystems to our faculty. A substantial impediment to use of the Gerber and Sellers Reserves was overcome during the evaluation period when Kansas Department of Health and the Environment released funds to purchase equipment needed for land management of these biologically-fascinating, but challenging tracts. With these changes and hiring an aquatic biologist, we expect use of these reserves will increase in the future. During the evaluation period, the Ninnescah Reserve was the site of thesis research for three MS students, all of whom have graduated. Two publications from previous graduate students' thesis research at the Ninnescah Reserve appeared in international, peer-reviewed journals. The Ninnescah Reserve also became the primary site of research for a National Science Foundation grant (PI = G. Houseman) awarded in 2015.

### *Resources*

During the evaluation period, the Biology MS program has consistently been at capacity as determined by faculty numbers and assistantship funding. Also, during the evaluation period we lost two faculty members. Adequate faculty numbers are critical to maintaining faculty productivity as well as a large, intellectually engaged graduate student community. Currently, we have 10 tenured or tenure-track faculty. This is less than half of the number of tenure or tenure-track faculty at four of our five peer institutions.

Peer Institution	Number of Tenured or Tenure-track Faculty Members in Biology Department
New Mexico State University	21
University of Massachusetts-Lowell	16
University of Nevada-Reno	29
University of North Dakota	20
Wright State University	24

With departmental, college, university and professional service demands divided among a small number of 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. Adequate numbers of staff also are crucial for meeting the demands of an active department that is administering substantial external research awards.

Graduate teaching assistantships are a critical resource for maintaining a dynamic MS program when federal research funding, which 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 laboratories. Our ability to teach these labs supports our program, but also has far-reaching effects for the university because we provide courses needed by many other departments. 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.

#### *Goals for FY2018-FY2020*

1. Integrate at least two new faculty members (one EEO and one cell/molecular) into the Biology graduate program.
2. Maintain an active MS graduate program that consistently includes >20 students.
4. Graduate a minimum of 5 students from our MS program per year.
4. 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.

## APPENDIX

## UNDERGRADUATE PROGRAM

1. Degree Check sheet
2. Graduating Senior Questionnaire

## MASTERS PROGRAM

1. MS Exit Survey
2. Evaluation Rubric for Thesis Defense
3. Seminar Evaluation Form



## 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) must be 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)

**AND**

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

#### DEGREE AND CONCENTRATION OPTIONS (CHOOSE ONE)

<b>BS-BIOLOGY/BIOMED (A12A)</b>	<b>BS-ECO/ENVIRO/ORGAN (A12A)</b>	<b>BA-BIOLOGY/BIOMED (A12B)</b>	<b>BA-ECO/ENVIRO/ORGAN (A12B)</b>
+ 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

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 AND INDIVIDUAL PLAN)

<http://webs.wichita.edu/?u=bioscience&p=courselisting/clindex> INVESTIGATE MAJOR LEVEL BIOLOGY ELECTIVES

**COURSE ROTATION FOR ALL BIOLOGY MAJOR LEVEL COURSES-AS OF Spring 2018-SUBJECT TO CHANGE WITHOUT NOTICE**  
**\*APPROVED EEO ELECTIVES**

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	Field Botany
Biol 330 (5)*	General Microbiology	Biol 330 (5)*	General Microbiology	Biol 330 (5)*	General Microbiology	Biol 330 (5)*	General Microbiology	Biol 575	Field Ecology
Biol 418 (4)	Ecology	Biol 420 (4)	Molecular Cell Biology	Biol 418 (4)	Ecology	Biol 420 (4)	Molecular Cell 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/Environmental Microbiology	Biol 499 (2-4)	Research (arranged)	Biol 534 (3)	Human Physiology		
Biol 502 (4)*	Vascular Plants	Biol 534 (3)	Human Physiology	Biol 532 (4)*	Entomology	Biol 535 (2)	Human Physiology Lab		
Biol 527 (5)	Comparative Anatomy	Biol 535 (2)	Human Physiology Lab	Biol 560 (2)*	Plant Ecology	Biol 590 (3)	Immunology		
Biol 540 (4)*	Developmental Biology	Biol 590 (3)	Immunology	Biol 561 (2)*	Plant Ecology Lab	Biol 640P (3)*	Evolution		
Biol 570 (3)*	Conservation	Biol 510 (3)*	Ecological Management Restoration	Biol 640AB(3)	Human Anatomy	Biol 661 (3)	Pathogenic Microbiology		
Biol 640G(3)	Neurobiology	Biol 528(4)*	Parasitology	Biol 640AL(2)	Human Anatomy Lab	Biol 767 (3)	Mechanisms of Hormone Action		
Biol 710 (3)	Glycobiology	Biol 626 (3)	Reproductive Biology	Biol 640G (3)	Neurobiology	Biol 737 (3)*	Biostatistics		
Biol 725 (3)*	Biodiversity Analysis	Biol 738 (3)*	Plant/Animal Interactions	Biol 662 (3)	Virology	Biol 780 (3)	Molecular Genetics		
Biol 797 (1)	Seminar	Biol 760 (4)	Experimental Molecular Biology	Biol 666 (3)	Special Topics in Biochemistry	Biol 797 (1)	Seminar		
		Biol 797 (1)	Seminar	Biol 730 (3)	Cancer Biology				
				Biol 797 (1)	Seminar				

Rotation for additional science requirements

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	Phys 213 (5)	General College Physics I
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 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		

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

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

## **BIOLOGICAL SCIENCES**-info specific to WSU and your personal goals.

### **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 located 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/index>

**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).

[http://webs.wichita.edu/depttools/depttoolsmemberfiles/generaleducation/WSU\\_Gen\\_Educ\\_Bro8.14\\_Web.pdf](http://webs.wichita.edu/depttools/depttoolsmemberfiles/generaleducation/WSU_Gen_Educ_Bro8.14_Web.pdf)

## **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**- [http://www.wichita.edu/thisis/home/?u=chp\\_studentservices](http://www.wichita.edu/thisis/home/?u=chp_studentservices)

**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/>

**How to Waitlist a course**

<http://webs.wichita.edu/depttools/depttoolsmemberfiles/bioscience/HOW%20TO%20WAITLIST%20A%20COURSE%20AT%20WICHITA%20STATE%20UNIVERSITY.pdf>

**STUDENT SUCCESS**-assistance in maximizing time spent with academics and personal goals.

<http://www.wichita.edu/thisis/home/?u=ofdss>

**Visit Wichita.edu and search for information not listed here.**

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

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

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

**SEMESTER****OFFERED****COURSE NUMBER****COURSE NAME**

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) (2) (two enrollments)
FL & SP	BIOL 210	General Biology I (4)
FL & SP	BIOL 211	General Biology II (4)
FL	BIOL 419	Genetics (4)
SP	BIOL 420	Molecular Cell Biology (4)
ALL <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 to be chosen from the following:

FL	CHEM 514	Inorganic Chemistry (3)
SP	CHEM 524	Instrumental Methods of Chemical Analysis (4)
FL	CHEM 546	Physical Chemistry I (3)
SP	CHEM 548	Physical Chemistry II (3)
FL	CHEM 605	Medicinal Chemistry (3)
FL & 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)
FALL EVEN	BIOL 710	Glycobiology (3)
FALL ODD	BIOL 730	Cancer Biology (3)
SP ODD	BIOL 760	Experimental Molecular Biology (4)
SP EVEN	BIOL 780	Molecular Genetics (3)
ALL	MATH 242	Calculus I (5)
ALL	MATH 243	Calculus II (5)
ALL	MATH 344	Calculus III (3)

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

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

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

GRADUATING SENIOR QUESTIONNAIRE  
Biological Sciences

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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) \_\_\_\_\_

### 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.  $\leq 2$     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.  $\leq 2$     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 or 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:

**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 shortcomings 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	1	2	3	4	N/A	

able to orally communicate scientific research in meeting-style presentations and in seminars.	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**



Biology 497/797: Biology Colloquium – Biology Seminar

Spring 2016

Mondays 4:00 - 5:00 pm

Hubbard Hall 218



FACULTY Evaluations

Evaluator: \_\_\_\_\_

(Optional)

Speaker: \_\_\_\_\_ Date: \_\_\_\_\_

Title: \_\_\_\_\_

Please evaluate the following based upon your level of agreement: 1 (strongly disagree) to 5 (strongly agree)

For any that you *strongly disagree*, please provide comments to assist the speaker in improving his/her presentation.

1. The speaker provided adequate background that allowed me to understand the topic 1 2 3 4 5

Comments:

2. The speaker provided a specific hypothesis or idea to be tested 1 2 3 4 5

Comments:

3. Experimental methods sufficiently tested the speaker's hypothesis 1 2 3 4 5

Comments:

4. The speaker provided a summary of the experimental results relating 1 2 3 4 5

to the hypothesis

Comments:

5. The speaker provided a conclusion that related to the hypothesis 1 2 3 4 5

Comments:

6. The speaker provided useful, instructive slides 1 2 3 4 5

Comments:

7. The speaker spoke clearly and was easy to understand 1 2 3 4 5

Comments:

8. The speaker adequately addressed questions 1 2 3 4 5

Comments:

9. The speaker fit the presentation within the 15 minute time-frame 1 2 3 4 5

Comments:

10. Before the presentation, I was interested in the research topic 1 2 3 4 5

Comments:

11. 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

Comments:

12. Please provide useful comments for the speaker including ideas on improving speaking methods or research methods.

13. Overall, how would you rate the presentation? Circle one: Poor Fair Good Very good Outstanding  
(1) (2) (3) (4) (5)