WSU Five-Year Program Review
Self-Study

Cover Page

Department/Program:	Zoology
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Brief Introductory Statement

Courses in the Department of Zoology include: (1) courses for non-science majors that fulfill the life-science general-education requirement, (2) lower-division courses that are service courses for science and non-science majors pursuing careers in medicine (some fulfilling life-science general education requirements), (3) lower-division courses in Zoology for science majors (some fulfilling life-science general education requirements), and (4) upper-division courses in Zoology for science majors. Courses are diverse and emphasize both important zoological content and practical skills relevant to careers in the sciences. Most courses in categories 2 to 3 include laboratories that provide high-impact experiences. Faculty members are well qualified and students overall indicate teaching in the department is better or much better than average (based on student course evaluations, available in annual reports of faculty). Enrollment, number of graduates, and student-faculty ratio remained relatively stable during the review period (Table below). The proportion of Zoology majors that are female exceeded males in every year and dramatically increased during the review period (Table below).

Student & Faculty Statistical Summary (Data provided by Institutional Effectiveness)					
Zoology	2012-13	2013-14	2014-15	2015-16	2016-17
Student Credit Hours Total [1]	**11,307**	**10,621**	**11,179**	**10,942**	**9,701**
Student FTE Total [2]	**376.90**	**354.00**	**372.60**	**364.70**	**323.37**
Student Majors [3]	352	369	369	402	384
other (2nd or 3rd majors)	80	43	40	43	38
Program Graduates [4]					
Associate Degree					
Bachelor Degree	41	25	41	42	38
Student Demographic Profile [5]					
Female	187	208	206	241	237
Male	165	161	163	161	147
Faculty FTE Total [6]	**17.49**	**15.63**	**16.84**	**17.94**	n/a
Adjunct FTE	5.75	6	5.81	6.26	n/a
Contract FTE	11.74	9.63	11.03	11.68	n/a
Student/Faculty Ratio [7]	**21.55**	**22.65**	**22.13**	**20.33**	n/a

Standard A - Mission Statement

Mission

The Department of Zoology provides rigorous, engaging, and relevant educational opportunities, resources, and expertise in all facets of animal biology and associated life sciences.

Values

- Encourage freedom of exploration in the life sciences.
- Serve diverse students at varied levels of engagement in animal biology including general education courses, support courses for non-zoology degrees across campus, and a diversity of courses relevant for careers in the sciences.
- Involve students in active research and community service.
- Through research and service, contribute new knowledge within fields of zoology and related life sciences.
- Through rigorous coursework and independent instruction, confer skills in problem solving, critical thinking, communication, and disciplinary methods, which facilitate productive futures for Zoology students and, especially, Zoology graduates.
- Strengthen life-science education and practice across Weber State University and throughout associated communities along the northern Wasatch Front metropolitan areas of Weber, Davis, and surrounding counties.

Standard B - Curriculum

General education Curriculum Map

Zoology Curriculum Map: general education Zoology courses for majors

			Natural Science				Life Science			
Number	**Title**	**Hours**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Required course										
ZOOL 1120	Principles of Zoology I	4	X	X	X	X	X	X	X	X
Support course										
ZOOL 2200	Human Physiology	4	X	X	X	X	X	X	X	X

Non-general education Curriculum Map

Zoology Curriculum Map: non-general education Zoology courses for majors

Emphasis Ratings: I = Introduced, E = Emphasized, U = Utilized, A = Assessed Comprehensively

			Learning Outcomes									
			Concepts						Competencies			
Number	**Title**	**Hours**	**1**	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**
Required courses												
ZOOL 1120	Principles of Zoology II	4	U	-	-	-	I	I	U	U	I	I
ZOOL 3200	Cell Biology	4	U	A	U	-	A	E	A	A	A	-
ZOOL 3300	Genetics	4	A	E	A	-	E	-	A	A	U	U
ZOOL 3450	Ecology	4	I	-	-	A	-	A	U	A	A	E
ZOOL 3600	Comparative Physiology	4	U	A	U	E	A	A	A	A	A	U
ZOOL 3720	Evolution	3	A	U	E	E	E	-	A	I	A	A
ZOOL 4990	Seminar	1	-	-	-	-	-	-	A	-	A	A
Elective courses (4 required)												
ZOOL 3470	Zoogeography	3	U	-	-	E	-	E	A	-	A	-
ZOOL 3500	Conservation Biology	3	U	-	I	U	I	I	I	U	U	E
ZOOL 4050	Comparative Vertebrate Anatomy	4	A	-	-	-	A	-	-	-	-	-
ZOOL 4100	Vertebrate Embryology	4	A	-	I	-	A	-	-	-	-	-
ZOOL 4120	Histology	4	-	A	-	-	A	-	-	-	-	-
ZOOL 4210	Advanced Human Physiology	4	-	U	I	-	A	A	A	U	A	I
ZOOL 4220	Endocrinology	4	-	U	I	-	A	A	A	U	A	I
ZOOL 4250	Radiation Biology*	4										
ZOOL 4500	Parasitology	4	E	E	-	E	E	-	U	U	U	-
ZOOL 4600	Protozoology*	4										
ZOOL 4300	Molecular Genetics	4	I	E	A	-	I	-	U	A	E	U
ZOOL 4350	Animal Behavior	4	U	-	I	-	I	-	A	A	U	-
ZOOL 4470	Wildlife Ecology & Management	4	E	-	-	A	-	A	A	A	A	A
ZOOL 4480	Aquatic Ecology	4	E	-	-	A	E	A	A	A	A	E
ZOOL 4640	Entomology	4	I	-	-	I	A	-	-	-	-	-
ZOOL 4650	Ichthyology	4	A	-	U	-	A	E	A	A	A	A
ZOOL 4660	Herpetology	4	E	-	U	A	E	-	E	-	A	A
ZOOL 4670	Ornithology	4	U	-	E	U	A	E	U	E	A	A
ZOOL 4680	Mammalogy	4	A	-	U	-	A	-	A	A	A	A
Support courses												
ZOOL 2100	Human Anatomy	4	-	I	-	-	E	I	I	-	I	-

* Course not recently taught and not currently in rotation

Standard C - Student Learning Outcomes and Assessment

Measurable Learning Outcomes – *General Education Major's Courses*

FOUNDATIONS OF THE NATURAL SCIENCES

After completing the natural sciences general education requirements, students will demonstrate their understanding of general principles of science:

1. NATURE OF SCIENCE. Scientific knowledge is based on evidence that is repeatedly examined, and can change with new information. Scientific explanations differ fundamentally from those that are not scientific.
2. INTEGRATION OF SCIENCE. All natural phenomena are interrelated and share basic organizational principles. Scientific explanations obtained from different disciplines should be cohesive and integrated.
3. SCIENCE AND SOCIETY. The study of science provides explanations that have significant impact on society, including technological advancements, improvement of human life, and better understanding of human and other influences on the earth's environment.
4. PROBLEM SOLVING AND DATA ANALYSIS. Science relies on empirical data, and such data must be analyzed, interpreted, and generalized in a rigorous manner.

THE LIFE SCIENCES

Students will demonstrate their understanding of the following characteristics of life:

1. LEVELS OF ORGANIZATION: All life shares an organization that is based on molecules and cells and extends to organisms and ecosystems.
2. METABOLISM AND HOMEOSTASIS: Living things obtain and use energy, and maintain homeostasis via organized chemical reactions known as metabolism.
3. GENETICS AND EVOLUTION: Shared genetic processes and evolution by natural selection are universal features of all life.
4. ECOLOGICAL INTERACTIONS: All organisms, including humans, interact with their environment and other living organisms.

Measurable Learning Outcomes – *Non-general Educations Major's Courses*

CORE CONCEPTS

1. EVOLUTION: The diversity of life is the result of mutation, adaptation, and selection pressure over time.
2. CELLULAR ORGANIZATION: All living things consist of one or more cells, the units of structure, function, and reproduction.
3. GENETICS: All living things share basic genetic mechanisms, which are responsible for the organization and continuity of life.
4. ECOSYSTEMS: All organisms are interconnected, interacting with each other as well as with their dynamic environment.
5. STRUCTURE AND FUNCTION: There is a relationship between molecular and organismal structure and function.
6. SYSTEMS REGULATION: Biological systems are governed by chemical transformations and homeostasis.

CORE COMPETENCIES

1. THE PROCESS OF SCIENCE: Students will use observational strategies to test hypotheses and critically evaluate experimental evidence.
2. QUANTITATIVE REASONING: Students will represent diverse experimental data sets graphically and apply statistical methods to them.
3. COMMUNICATION: Students will explain scientific concepts to different audiences and work collaboratively to explore biological problems.
4. SCIENCE AND SOCIETY: Students will develop biological applications to evaluate and address societal problems.

Five-year Assessment Summary

At the time of the last program review (2011-2012) there was little formal assessment data collected for any course in the Department of Zoology. To fill this void, the Department began to emphasize assessment more than in the past.

As is observable in the annual assessment reports (https://www.weber.edu/portfolio/zool_1415.html), the first standardized assessment data using Chi Tester became available in 2014-2015 and again in 2015-2016. Data available in these years were for general-education courses due to the need to accrue data that would allow general-education renewal in 2016. All general-education courses gained renewal, with sufficient assessment results that no additional action (besides continued assessment) is required.

The Department developed a new assessment plan in 2016 to begin the process of gaining assessment data for core courses within the Zoology major (https://www.weber.edu/portfolio/zool_ap.html). New student-learning outcomes were also developed (https://www.weber.edu/portfolio/zool_slo.html). Instructors align each course with the new learning outcomes within the curriculum grid (see above) as assessment occurs. We report the first such data for those courses here (Appendix). The majority of non-general education courses in the major still need of formal assessment, which will continue to be an emphasis in the coming years.

Assessment of Graduating Students

Seminar (Zool 4990) serves as a capstone course for Zoology majors and is typically taken in the last year of study. As a way to assess graduating majors of the Department of Zoology students enrolled in Seminar in Spring semesters will be required to take the Collegiate Learning Assessment (CLA) (https://www.weber.edu/portfolio/zool_ap.html). The CLA test evaluates critical-thinking and written-communication skills of college students. It measures analysis and problem-solving, scientific and quantitative reasoning, critical reading and evaluation, and critiquing argument, in addition to writing mechanics and effectiveness. Over 700 institutions—both in the United States and internationally—have used the CLA to benchmark value-added growth in student learning at their college or university compared to that of other institutions.

Data from the Collegiate Learning Assessment are available for academic years 2014-15, 2015-16, and 2016-17. In these years, Zoology majors scored above the campus-wide average and were rated as basic to proficient on a scale of below basic to proficient to advanced.

Standard D - Academic Advising

Advising Strategy and Process

College of Science, General Education advising:
Students interested in science who have not yet declared a major are advised by Jane Stout of the College of Science Academic Advisement Office. The mission of this office is to teach the purpose and value of higher education through one-on-one appointments, open orientation classes, and provide opportunity for peer mentors through student clubs and organizations. Once a student shows specific interest in zoology or a zoology-related field, Jane and her staff direct those students to the Department.

General zoology major advising:
Advising for Zoology majors has been restructured since the last program review. Although many Zoology majors declare their major upon enrollment, and thus are not subject to mandatory advising, all students who declare a major thereafter (meaning they must contact the Department to do so) are required to schedule an advising and orientation appointment with the Zoology chair. The chair discusses career goals with each student and orients them to the Zoology curriculum and resources available in the Department. The chair also directs them to other advisors within the department.

Pre-health-profession advising:
Students interested in human-health related professions (e.g. medical doctors, dentists, optometrists, chiropractors, podiatrists, pharmacists, physical and occupational therapists, and physician assistants) are directed to a pre-professional advisor who has expert knowledge in gaining entry into such programs. This type of advising is not specific to the Department of Zoology, because graduates with a variety of majors may apply to enter post-graduate professional schools. However, Dr. Barb Trask is the pre-professional advisor.

Pre-veterinary advising:
Students interested in becoming veterinarians and are advised by Dr. Ron Meyers, who discusses the courses required by veterinary schools as well as the most relevant elective classes to take. He also supervises the Pre-Vet club and reviews student applications and personal statements.

Wildlife and Conservation Ecology advising:
Students interested in wildlife and natural resources are advised by Dr. John Cavitt. As part of this advising, Dr. Cavitt initiated a new student chapter of the Wildlife Society. The Wildlife Society's student chapters are composed of student and professional members of the Society. Based at college campuses across North America, these chapters establish their own locally-focused objectives and have their own bylaws, officers, committees, and dues structure. The WSU chapter regularly hosts seminars by wildlife biologists.

Mentoring via Independent Study and Undergraduate Research activities:
Many students with Zoology majors and some students with majors in other departments engage in independent study courses and/or undergraduate research projects with members of the Zoology faculty. These students receive much informal advising via the professional relationship they establish with their mentors. All Zoology faculty members engage in mentoring students who are conducting undergraduate research.

Graduate School advising:
Students interested in pursuing graduate degrees are advised by Dr. Ron Meyers who discusses the best way to find a graduate program and how to contact prospective graduate-research mentors.

Graduation Sign Off:
The Department of Zoology chair meets with all students early in the semester in which they plan to graduate. This serves as a last-call for advising. The chair ensures the student is qualified to graduate and discusses plans for attending graduation and for future endeavors. Information on future plans is recorded and students are encouraged to keep in touch as their future unfolds.

Zoology minor advising:
Students pursuing science degrees in other departments may choose Zoology as a minor. Dr. Nicole Berthélémy serves as advisor for such students. She ensures students are aware of minor requirements and discusses curriculum options with them as they relate to their academic and career goals.

Bachelor of Integrated Studies advising:
Students pursuing a Bachelor of Integrated Studies (BIS) degree may choose Zoology as one of their areas of emphasis. The BIS degree is interdisciplinary. BIS majors select three areas or emphases (equivalent to having three minors). Students must work out a contract of courses to be taken for each area of emphasis by working with an advisor for each representative department. Dr. Brian Chung serves as BIS advisor for Zoology to help BIS majors determine courses that fit best with their other areas of emphasis and with their career goals.

Effectiveness of Advising
The Department does not have any means to assess effectiveness of advising as of yet. In general, students are very appreciative of advising and our present focus is to continue to increase and improve advising opportunities.

Past Changes and Future Recommendations
As alluded to above, advising has been re-structured such that all major and minor declarations made within the Department (i.e. post initial enrollment) require advising. We have also restructured our advising approach such that students are no longer assigned an advisor based on the alphabet. Instead, they are encouraged to select an advisor based on common areas of interest or based on their rapport with a specific professor.

Standard E - Faculty

Faculty Demographic Information

The Department of Zoology includes 11 full-time tenured or tenure-track faculty members with expertise in a breadth of topics. All have earned Ph.D.'s, representing 10 different North American universities (see table below). Ten faculty members are tenured associate professors and eight are full professors.

Department of Zoology Full Time, Tenured Faculty

Name	Rank	Ph.D. granted by	Research & Teaching Emphasis
Berthélémy, Nicole	Professor	University of California, Davis	Toxicology, Human Physiology
Cavitt, John	Professor	Kansas State University	Avian Ecology, Wildlife Management
Chung, Brian	Assoc. Professor	University of Calgary	Gastrointestinal Development, Human Anatomy
Clark, Jonathan	Professor	Ohio State University	Molecular, Evolutionary Genetics
Hoagstrom, Christopher	Professor	South Dakota State University	Aquatic Ecology, Fish Biology
Marshall, Jonathon	Assoc. Professor	Brigham Young University	Evolutionary Genetics, Herpetology
Meyers, Ron	Professor	Brown University	Vertebrate Evolution, Functional Morphology
Mull, John	Professor	Utah State University	Insect Ecology, Invertebrate Zoology
Skopec, Michele	Professor	University of Wisconsin	Mammal Nutrition, Toxicology, Human Physiology
Trask, Barbara Crippes	Professor	Washington University, Saint Louis	Molecular Cell Biology
Xiang, Lin	Assist. Professor	University of California, Davis	Life-science education

Until Fall 2017, the Department included two additional tenured professors, Drs. Robert Okazaki and Samuel Zeveloff. Both professors retired at the end of the 2016-2017 fiscal year.

Faculty in the Department have taken on leadership roles within the College of Science and across campus. Several of these include reductions in teaching load from the standard 12-hour assignments. This, in part, supports the hiring of adjunct faculty. These reassignments include:

1. John Cavitt, Director, Office of Undergraduate Research (6-hour reduction), Chair, University Curriculum Committee (3-hour reduction);
2. John Mull, Director, Ritchey Science Fair (3.5 hour reduction);
3. Barb Trask, Associate dean (6-hour reduction);
4. Lin Xiang, Center for Science and Math Education (CSME, 6-hour reduction).

The Department of Zoology includes 2 full-time visiting assistant professors (both Ph.D.'s) and five adjunct professors (three Ph.D.'s, two Masters). All adjuncts have multiple semesters of teaching experience within the Department

Department of Zoology Full Time-Temporary and Adjunct Faculty

Name	Position	Degree	Institution
Connors, Patrice Kurnath	Visiting Assistant Professor	Ph.D.	University of Utah
Gurr, Susan	Adjunct	Masters	Weber State University
Hoffman, Rosemary	Adjunct	Ph.D.	University of Mississippi Medical Center
Lewis-Roger, Nicole	Visiting Assistant Professor	Ph.D.	Brigham Young University
Prothero, Walter	Adjunct	Masters	Utah State University
Robinson, Ami Sessions	Adjunct	Ph.D.	Southern Illinois University
Zeveloff, Samuel	Adjunct	Ph.D.	University of Wyoming

Programmatic/Departmental Teaching Standards

Although there are no formal, written standards, certain educational values are adhered to. Student engagement is a high priority and a variety of methods are used to accomplish this. Class activities often emphasize skills fundamental to success in all fields of biology, such as experience with standard laboratory and field practices, written and oral communication, and use of scientific literature. The majority of courses address these goals in one way or another.

Most courses in the major include laboratories and faculty expend considerable energy devising and administering laboratory activities. These activities include field trips and field-work experiences, laboratory experiments and observations, instruction in scientific methodologies, and student presentations and group projects. Faculty teach their own labs except in the cases of Human Anatomy (ZOOL 2100) and Human Physiology (ZOOL 2200), where students serve as lab instructors overseen by a professor.

There is a legacy of teaching excellence within the Department. Three faculty members (Sam Zeveloff, 2006, retired; John Cavitt, 2010; John Mull, 2016) have been recognized as Brady Presidential

Distinguished Professors. Three retired faculty members (Sam Zeveloff, 1993; Gloria Wurst, 1995; Kent Van de Graaff, 2004) were awarded the John S. Hinckley Award for Teaching. Three Zoology faculty members have received the WSU College of Science Dr. Spence L. Seager Distinguished Teaching Award (Sam Zeveloff, 2000, retired; Jon Clark, 2007; Bob Okazaki, 2009, retired). Jon Clark was given the George and Beth Lowe Innovative Teaching Award in 2008. Bob Okazaki (retired) was one of five finalists for the Rodney H. Brady Crystal Crest Master Teacher Award in 2011. Four faculty members in the Department of Zoology (Gloria Wurst, 1991, retired; John Mull, 2004; Sam Zeveloff, 2008, retired; Michele Skopec, 2010) have been recognized as Nye Cortez Professors of the Year in the Honors Program. John Mull was selected as Honors Eccles Faculty Fellow in 2004-05. The legacy of these excellent teachers lives on in those award winners that remain in the Department as well as the faculty they and retired award winners have mentored.

Faculty Qualifications (current academic year)

	Tenure	**Contract**	**Adjunct**
Number of faculty with Doctoral degrees	11	2	3
Number of faculty with Master's degrees	-	-	2
Total	**11**	**2**	**5**

Evidence of Effective Instruction

i. Regular Faculty

Tenured faculty are required to share student evaluations from two courses per year with the department chair and college dean. Faculty performance is reviewed every year with specific emphasis on student evaluations. Evaluation questions in the College of Science use a 7-point scale and Zoology professors as a group tend to average above 4 (a rating of average) and for most professors in most categories, their scores are higher. There are many instances among professors and courses in which ratings exceed 5 (a rating of above average) or even 6 (a rating of very good). It is uncommon for a rating in any category to be below 4.

Assessment data now being generated in the Department provides another means to validate effective instruction. All of the general-education courses in the Department have been assessed multiple times and have met the thresholds of learning for each learning outcome (often exceeding such thresholds substantially). This data corroborates the information from student evaluations.

Graduate surveys provide another means to garner student input on the effectiveness of instruction. Available survey data (below) support the conclusion that teaching is effective to achieve learning outcomes emphasized within the Department.

Zoology Graduate Survey Results (cumulative percent of ratings agreement; 5-point scale).

Question	2013 graduates (*n* = 26)	2014 graduates (*n* = 24)	2015 graduates (*n* = 16)	2016 graduates (*n* = 25)	2017 graduates (*n* = 23)
1. After completing my degree, my knowledge of the scientific method is much better.	95%	93%	100%	97%	96%
2. After completing my degree, my knowledge of evolution is much better.	94%	93%	91%	94%	96%
3. After completing my degree, my knowledge of genetics is much better.	92%	87%	84%	88%	94%
4. After completing my degree, my knowledge of the structure and function of animals is much better.	94%	92%	90%	95%	97%
5. After completing my degree, my knowledge of the organization of life, from molecules to ecosystems is much better.	95%	94%	94%	96%	93%
6. After completing my degree, my knowledge of ecology and the effect of humans on the biosphere is much better.	94%	94%	95%	91%	96%
7. I strongly agree, my education in zoology has provided me with an awareness of career opportunities available in zoology.	77%	83%	75%	86%	89%
8. I strongly agree, my education in zoology has prepared me for employment or for graduate or professional school.	86%	92%	89%	92%	90%
9. I strongly agree, my education in zoology has provided me with an understanding of how scientific ideas are communicated.	94%	91%	86%	94%	93%
10. I strongly agree, my education in zoology has enhanced my oral and written communication skills.	91%	89%	89%	93%	92%
11. I strongly agree, my education in zoology has enhanced my critical thinking abilities.	97%	95%	89%	95%	92%

ii. Adjunct Faculty

Part-time, adjunct faculty members are subject to student evaluations for every course taught. The department chair reviews the results of these evaluations and also corresponds periodically with adjunct faculty concerning their teaching approach. Although student evaluation scores for adjunct professors tend to be lower than for tenured faculty, they generally fall within the range of 3 (below average) to 5 (above average). Reasons for lower scores include less experienced teachers, teaching assignments of largely introductory courses (which tend to have less experienced students), and many adjunct-taught courses are scheduled at non-traditional hours, such as in the evenings in which students may be less engaged due to having worked all day prior to class.

The chair determines the teaching schedule for adjunct faculty members and oversees their recruitment, hiring, ongoing professional development and regular evaluation. However, adjunct

faculty members are appointed by the college academic dean for a specific period of time (based on a recommendation by the chair). Adjunct faculty in Zoology are hired on a semester-by-semester basis. Hiring is based on qualification, ability, and need.

Faculty Scholarship

Scholarship is strong in the Department of Zoology. All faculty are actively engaged in research activities, including research with undergraduate students. During the review period, the department averaged nearly 10 publications per year in external venues. These publications are listed below with faculty authors shown in bold and student authors in bold and italics.

1. Ackerman JT, Herzog MP, Hartman CA, Isanhart J, Herring G, Vaughn S, **Cavitt JF**, Eagles-Smith CA, Browers H, Cline C, Vest JL (2015) Mercury and Selenium Contamination in Waterbird Eggs and Risk to Avian Reproduction at Great Salt Lake, Utah. *U.S. Geological Survey Open-File Report* 2015-1020:164.
2. Adams RP, **Skopec MM**, Muir JP (2014) Comparison of leaf terpenoids and tannins in *Juniperus monosperma* from woodrat (*Neotoma stephensi*) browsed and non-browsed trees. *Phytologia* 96:63-70.
3. Adams RP, **Skopec MM**, Muir JP (2016) Comparison of leaf terpenoids and tannins in *Juniperus osteosperma* from woodrat (*Neotoma lepida*) browsed and non-browsed trees. *Phytologia* 98:17-25.
4. Adams RP, **Skopec MM**, Kohl K, Dearing MD (2014) Comparison of volatile leaf terpenoids from *Juniperus monosperma* and *J. osteosperma* leaves intact, ground and exposed to ambient temperature. **Phytologia**. 96:207-217.
5. ***Arnt JL***, ***Neisler E*** (2016) Chronic Effects of Intermittent Sound Disturbance on Buenos Aires Tetra. *The Journal of the Utah Academy of Sciences, Arts, & Letters* 93:19-36.
6. ***Barrett A***, ***Gnehm D***, ***Jones J***, **Trask BC** (2013) α1-Antitrypsin and C-Reactive Protein Levels in Tear Fluid After Continuous Contact Lens Wear. *Clinical and Experimental Optometry* 97:66-71.
7. Bastiaans E, Bastiaans MJ, Morinaga G, Castañeda Gaytán JG, **Marshall JC**, Bane B, Méndez de la Cruz F, Sinervo B, (2014) Female preference for sympatric vs. allopatric male throat color morphs in the mesquite lizard (Sceloporus grammicus) species complex. *Plos One* 9: e93197
8. Bastiaans E, **Marshall JC**, Sites JW, Morinaga G, Sinervo B (2013). Interpopulation variation in throat color morphs in an incipiently speciating lizard: From blue to white and back again. *Integrative and Comparative Biology* 53:e11.
9. Bastiaans E, Morinaga G, Castañeda Gaytán JG, Marshall JC, Sinervo B (2013) Male agonistic behavior varies with throat color in two populations of the mesquite lizard (*Sceloporus grammicus*) species complex with different color morphs. *Behavioral Ecology* 24:882-986.
10. Bravo A, Porzecanski E, Sterling EJ, Bynum N, Cawthorn M, Fernandez D, Freeman LJ, Ketcham SR, Leslie TW, **Mull JF**, Vogler D (2016) Teaching for higher levels of thinking: developing quantitative and analytical skills in environmental science course. *Ecosphere* 7:1-20.
11. **Cavitt JF**, Jones S, Wilson N, Zimmerman T (2014) Atlas of Breeding Colonial Waterbirds within the Western United States. *U.S. Fish and Wildlife Service Special Publication*. http://www.fws.gov/mountain-prairie/species/birds/western_colonial/
12. ***Christensen LA***, ***Allred LM***, Goller F, **Meyers RA** (2017) Is sexual dimorphism in singing behavior related to syringeal muscle composition? *Auk* 134:710-720.
13. **Clark J**, ***Nguyen S*** (2014) Genetic analysis of Invertebrates from Great Salt Lake. *Acta Geologica Sinica* 88:65-68.
14. Collyer ML, Hall MD, Smith MD, **Hoagstrom CW**. 2015. Habitat-morphotype associations of Pecos pupfish (*Cyprinodon pecosensis*) in isolated habitat complexes. *Copeia* 103:181-199.

15. Combs MD, Knutsen RH, Broekelmann TJ, Toennies HM, Brett TJ, Craft CS, Atkinson JJ, Shipley JM, **Trask BC**, Mecham RP (2013) Microfibril-associated glycoprotein 2 (MAGP2) loss-of-function has pleiotropic effects in vivo. *Journal of Biological Chemistry* 288:28869-28880.

16. Cooper BG, Mendez JM, Whetstone AG, **Meyers RA**, Goller F (2012) Age-related changes in the Bengalese Finch song motor program. *Neurobiology of Aging* 33:564-568.

17. Davenport SR, **Mull JF**, **Hoagstrom CW** (2013) Attempted consumption of a dangerous, riparian ant (*Camponotus vicinus*) by a threatened, fluvial minnow (*Notropis simus pecosensis*). *Southwestern Naturalist* 58:126-128.

18. Echelle AA, Schwemm MR, Lang NJ, Nagle BC, Simons AM, Unmack PJ, Fisher WL, **Hoagstrom CW** (2014) Molecular systematics and historical biogeography of the *Nocomis biguttatus* species group (Teleostei: Cyprinidae): Nuclear and mitochondrial introgression and a cryptic Ozark species. *Molecular Phylogenetics and Evolution* 81:109-119.

19. Ellis K, **Cavitt JF**, Larson R (2015) Factors influencing Snowy Plover nest survival at Great Salt Lake, Utah. *Waterbirds Journal* 38:58-67.

20. Ellis K, Larson R, Knight R, **Cavitt JF** (2014) Occupancy and detectability of Snowy Plover in western Utah: an application to a low density population. *Journal of Field Ornithology* 85:355-363.

21. Ennen JR, Matamoros WA, Agha M, Lovich JE, Sweat S, **Hoagstrom CW** (2017) Hierarchical, quantitative biogeographic provinces for all North American turtles and their contribution to the biogeography of turtles and the continent. *Herpetological Monographs* 31:114-140.

22. Hall L, **Cavitt JF**. 2012. Comparative study of trapping methods for ground-nesting shorebirds. *Waterbirds* 35:342-346.

23. ***Hancock J***, ***Goff Z***, **Trask B** (2013) From Ignoble Beginnings to the Nobel Prize: A conversation with Mario Capecchi. *The Contemporary West* 30:61-79.

24. ***Hansen SA***, Ashley A, **Chung BM** (2015) Complex dietary protein improves growth through a complex mechanism of intestinal peptide absorption and protein digestion. *Journal of Parenteral and Enteral Nutrition* 39:95-103.

25. **Hoagstrom CW** (2014) Drift versus retention: an alternative perspective to Wilde and Urbanczyk's 'relationship between river fragment length and persistence of two imperiled great plains cyprinids'. *Journal of Freshwater Ecology* 29:449-452.

26. **Hoagstrom CW** (2014) Habitat loss and subdivision are additive mechanisms of fish extinction in fragmented rivers. *Global Change Biology* 21:4-5.

27. **Hoagstrom CW**, Archdeacon TP, Davenport SR, Propst DL, Brooks JE (2015) Intrafragment riverscape conservation for an imperiled, small-bodied, pelagic-broadcast spawning minnow: speckled chub (*Macrhybopsis aestivalis*). *Canadian Journal of Fisheries and Aquatic Sciences* 72:527-537.

28. **Hoagstrom CW**, Turner TF (2015) Recruitment ecology of pelagic-broadcast spawning minnows: paradigms from the ocean advance science and conservation of an imperilled freshwater fauna. *Fish and Fisheries* 16:282-299.

29. **Hoagstrom CW**, Ung V, Taylor K (2014) Miocene rivers and taxon cycles clarify the comparative biogeography of North American highland fishes. *Journal of Biogeography* 41:644-658.

30. ***Ingraham D***, **Berthélémy NJ** (2015) Effects of Mercury (II) chloride exposure on life parameters and Hsp70 expression in brine shrimp *Artemia franciscana*. *The Journal of the Utah Academy of Sciences, Arts and Letters* 92:67-81.

31. Kohl K, **Skopec MM**, Dearing MD (2014) Captivity results in disparate loss of gut microbial diversity in closely related hosts. **Conservation Physiology** 2:cou009.

32. Leyte-Manrique A, Hernández-Salinas U, Ramírez-Bautista A, Mata-Silva V, **Marshall JC** (2017) Ecomorphology of eight populations of *Sceloporus grammicus* (Squamata: Phrynosomatidae) from the Mexican plateau. *Integrative Zoology* 12:198-210.

33. Malenke J, **Skopec MM**, Dearing MD (2014) Evidence for functional convergence in genes upregulated by herbivores ingesting plant secondary compounds. *BMC Ecology* 14:23.

34. **Marshall JC**, ***Carrethers N***, Schwab T, Beck G, Alvarez Gutièrrez L (2015) The PhD labor market imbalance and its effect on life science departments. *Journal of the Utah Academy of Science, Arts, and Letters* 9:81-88.

35. Matamoros WA, **Hoagstrom CW**, Schaefer JF, Kreiser BR (2016) Fish faunal provinces of the conterminous United States of America reflect historical geography and familial composition. *Biological Reviews* 91:813-832.

36. **Meyers RA**, ***McFarland J*** (2016) Anatomy and histochemistry of spread-wing posture in birds. 4. Eagles soar with fast, not slow muscle fibers. *Acta Zoologica* 97:319-324.

37. Osborne MJ, Diver TA, **Hoagstrom CW**, Turner TF (2016) Biogeography of "*Cyprinella lutrensis*": intensive genetic sampling from the Pecos River 'melting pot' reveals a dynamic history and phylogenetic complexity. *Biological Journal of the Linnean Society* 117:264-284.

38. Redón S, **Berthélémy NJ**, Vasileva GP, Mutafchiev Y, Amat F, Georgiev BB (2015) Helminth parasites from *Artemia franciscana* (Crustacea, Branchiopoda) in the Great Salt Lake, Utah: first data from the native range of this invader in European wetlands. *Folia Parasitologica* 62:030.

39. ***Schmalz JM***, Wachocki B, Wright M, **Zeveloff SI**, **Skopec MM** (2014) Habitat selection by the pygmy rabbit (*Brachylagus idahoensis*) in Northeastern Utah. *Western North American Naturalist* 74:456-466.

40. ***Shaney K***, **Marshall JC** (2013) Herpetofaunal biodiversity survey along the Wasatch Mountains, Utah: A focus on Morgan and Weber Counties. *Southwestern Center for Herpetological Research Bulletin* 3:17-22.

41. **Skopec MM** (2014) Physiological Ecology of Nutrient Acquisition in Animals. In *Oxford Bibliographies in Ecology*. Ed. David Gibson. New York: Oxford University Press.

42. **Skopec MM**, ***Hale AJ***, Torregrossa A, Dearing MD (2013) Biotransformation Enzyme Expression in Nasal Epithelium of Woodrats. *Comparative Biochemistry and Physiology Part C* 157:72-79.

43. **Skopec MM**, Kohl KD, Schramm K, Halpert JR, Dearing, MD (2015) Using the specialization framework to determine degree of dietary specialization in a herbivorous woodrat. *Journal of Chemical Ecology* 41:1059-1068.

44. **Skopec MM**, Malenke J, Halpert JR, Dearing MD (2013) An in vivo assay for elucidating the importance of cytochromes P450 for the ability of a wild mammalian herbivore (*Neotoma lepida*) to consume toxic plants. *Physiological and Biochemical Zoology* 5:593-601.

45. Tepedino VJ, **Mull JF**, Griswold TL, Bryant G (2014) Reproduction and pollination of the endangered dwarf bear-poppy *Arctomecon humilis* (Papaveraceae) across a quarter century: Unraveling of a pollination web? *Western North American Naturalist* 74:311-324.

46. Thomas S, Lyons J, Andres B, Elliot-Smith E, Palacios E, **Cavitt JF**, Royle J, Fellows S, Howe W, Mellink E, Melvin S, Zimmerman T (2012) Population size of Snowy Plovers breeding in North America. *Waterbirds* 35:1-14.

47. ***Truong A***, Sondossi M, **Clark JB** (2017) Genetic identification of *Wolbachia* from Great Salt Lake brine flies. *Symbiosis* 72:95-102.

48. Vincze O, Kosztolányi A, Barta Z, Küpper C, AlRashidi M, Amat J, Ticó A, Burns F, **Cavitt JF**, Conway W, Cruz-Lopez M, Burgas D, Burke T, Figuerola J, Montalvo T, Székely T (2016) Parental cooperation in a changing climate: fluctuating environments predict shifts in care division. *Global Ecology and Biogeography* 25:1401-1413.

49. Vincze O, Székely T, Küpper C, AlRashidi M, Amat J, Ticó A, Burgas D, Burke T, **Cavitt JF**, Figuerola J, Montalvo T, Kosztolányi A (2013) Local environment but not genetic differentiation influences biparental care in ten plover populations. *Plos One* 8:e60998.

In addition to publications, faculty and students were very active in presentations on and off campus, within the USA and internationally. The number of such activities is too voluminous to provide here, but is available in the annual reports and curriculum vitae of departmental faculty (available upon request).

Mentoring Activities

Mentoring for junior faculty occurs through collaborations and informal activities. Senior faculty typically assist junior faculty assigned to teach common courses in several ways. Commonly, senior faculty will share materials, strategies, and approaches with junior faculty. They will also often discuss teaching successes and failures as collaborators. It is routine for faculty teaching shared courses to work together and coordinate for perpetual course revision and improvement, and junior faculty are a part of this process. All faculty have more freedom in development of specialized, upper-division courses. However, in these cases, support remains available from senior faculty for help in courses design and pedagogy.

In addition, there is a formal process of review for tenure and promotion. The chair has primary responsibility to guide junior faculty through this process, but all senior faculty are supportive and provide assistance as needed or requested. All Zoology faculty have received promotion and tenure on schedule through the period of the last several program reviews.

Diversity of Faculty

Diversity of faculty in the Department of Zoology is summarized in the "Faculty Profile" (below) and in diversity of expertise indicated in the Faculty description above (section E). In short, faculty members were originally selected to fulfill diverse roles and in all cases they continue to serve in diverse capacities with regard to courses taught as well as with regard to research emphases and service activities. The faculty includes individuals with notable expertise in all levels of biological organization (from molecules to ecosystems) and in many major groups of animals.

For tenured and tenure-track faculty, gender diversity is skewed with more males than females (7:4). For full-time contract faculty, gender diversity is entirely female (2). For adjunct faculty, gender diversity is even (2 female, 2 male).

For tenured and tenure-track faculty, ethnicity is skewed with predominantly individuals of Caucasian ancestry (n = 9), with two faculty having Asian ancestry. Both full-time contract faculty are Caucasian. All adjunct faculty are Caucasian.

Faculty Profile

Name	*Gender*	*Ethnicity*	*Job Title*	*Years of Employment*	*Areas of Expertise (Faculty)*
Berthélémy, Nicole	F	Caucasian	Professor	14	Toxicology, Human Physiology
Cavitt, John	M	Caucasian	Professor	19	Avian Ecology, Wildlife Management
Chung, Brian	M	Asian	Associate Professor	11	Gastrointestinal Development, Human Anatomy
Clark, Jonathan	M	Caucasian	Professor	20	Molecular, Evolutionary Genetics
Connors, Patrice Kurnath	F	Caucasian	Visiting Associate Professor	-	-
Gurr, Susan	F	Caucasian	Lab Manager, Adjunct Professor	14	-
Hoagstrom, Christopher	M	Caucasian	Professor	12	Aquatic Ecology, Fish Biology
Hoffman, Rosemary	F	Caucasian	Adjunct Professor	-	-
Lewis-Rogers, Nicole	F	Caucasian	Visiting Associate Professor	-	-
Linford, Monica	F	Caucasian	Administrative Specialist	3	-
Marshall, Jonathon	M	Caucasian	Professor	10	Evolutionary Genetics, Herpetology
Meyers, Ron	M	Caucasian	Professor	25	Vertebrate Evolution, Functional Morphology
Mull, John	M	Caucasian	Professor	20	Insect Ecology, Invertebrate Zoology
Prothero, Walter	M	Caucasian	Adjunct Professor	-	-
Robinson, Ami Sessions	F	Caucasian	Adjunct Professor	-	-
Skopec, Michele	F	Caucasian	Professor	12	Mammal Nutrition, Toxicology, Human Physiology
Trask, Barbara	F	Caucasian	Professor	15	Molecular Cell Biology
Xiang, Lin	F	Asian	Assistant Professor	2	Life-science education
Zeveloff, Samuel	M	Caucasian	Adjunct Professor	-	-

Ongoing Review and Professional Development

Tenure-track faculty are reviewed, as part of the tenure-and-promotion process, in their second, third, sixth, and eleventh years. Post-tenure review occurs every five years. Fully promoted professors can also apply for performance compensation every five years, which also entails a review process.

In the College of Science, tenured and tenure-track faculty submit an annual report of their activities including goals for the upcoming year. This includes a meeting with the department chair as well as an overall review of department progress by the dean. These annual reports are used as part of the post-tenure review mentioned above.

There are a variety of training opportunities on campus and many committee-led endeavors are also related to topics of professionalism. Further, faculty members maintain active connections with professional, off-campus organizations that pertain to their individual areas of interest. These groups are important sources of information and training opportunities that keep each person abreast of their own field.

Professional development is a key justification for ongoing research within the department because active research programs ensure that each zoology professor is engaged and continuing to grow within their discipline.

Standard F – Program Support
Support Staff, Administration, Facilities, Equipment, and Library

Adequacy of Staff

The Department of Zoology includes a full-time professional staff person (Laboratory Manager) and a full-time classified staff member (Administrative Specialist; see table below). Each has excellent credentials and is responsible for diverse, critical activities.

The Laboratory Manager (Susan Gurr) is responsible for ensuring lab rooms are properly equipped and maintained, that lab supplies are always on hand, that live animals in the Department are properly cared for, and that all classroom technology is maintained and properly serviced. Susan also oversees the live-animal facility in collaboration with Dr. Skopec. This facility is used for research and also to house animals used in course laboratories. Susan assists all faculty members and students using this facility. She supervises part-time (student) lab assistants who help her with all of these activities.

Susan handles purchasing for laboratory supplies. She also manages budgetary paperwork associated with purchasing as an aid to the chair.

Susan also organizes visits and tours from community organizations, such as schools and clubs. She collaborates with Dr. Mull as co-advisor for the Zoology Club, which is involved in many such activities.

The Administrative Specialist (Monica Linford) is the interface for students visiting, calling, or emailing the Department for information or for clerical assistance. She can answer a majority of questions

typically asked by students and direct them to proper individuals or resources as appropriate. She helps students with various clerical needs of all kinds. She also supervises a student office assistant, who also helps with these tasks.

Monica also handles a plethora of clerical duties and assists the chair with important tasks such as course scheduling, textbook ordering, purchasing office supplies, tracking course enrollment, and tracking applications for graduation. Her responsibilities increasingly include contacting students for a suite of campus-wide initiatives intended to increase student success and retention.

As part of efforts to strengthen the image of the Department and awareness of department activities, Monica is the leader in planning a number of activities. These include the welcome banquet for new Zoology majors, the departmental newsletter, and the departmental awards ceremony.

i. Ongoing Staff Development

Staff members keep up with upgrades and changes to relevant university procedures and software. When training is necessary or desired, staff members are encouraged to take advantage. In many cases, staff members act as a liaison between training opportunities, faculty members, and the chair. Staff members are also encouraged to take advantage of other university support services at their disposal.

Adequacy of Administrative Support

Administration for the Department of Zoology includes the chair (Chris Hoagstrom), the Dean of the College of Science (David Matty), and the WSU Provost (Madonne Miner). The Chair oversees routine personnel, budgetary, and curricular issues. The Dean works closely with all department chairs in terms of budgetary and policy issues. He also provides direction with regard to curriculum development, student recruitment, advising, and retention. The Provost and Dean also sometimes provide support for various expenses when funding is available.

Funding and expenditures for the Department have remained relatively stable over the last five years (see table below). Some course fees were increased for the first time in many years during course-fee renewal for 2016-17. This provides much needed funding to maintain laboratory supplies and equipment.

Financial Analysis Summary (This information is provided by the Provost's Office) Zoology					
Funding	**12-13**	**13-14**	**14-15**	**15-16**	**16-17**
Appropriated Fund	1,189,692	1,198,524	1,240,999	1,291,160	1,455,848
Other:					
Special Legislative Appropriation					
Grants or Contracts					
Special Fees/Differential Tuition	58,155	35,061	43,192	36,600	63,572
Total	1,247,847	1,233,585	1,284,191	1,327,760	1,519,420
Student FTE	376.9	354.0	372.6	364.7	323.4
Cost per FTE	$3,311	$3,485	$3,447	$3,641	$4,699

The College of Science provides additional support staff including a Science Advisor (Jane Stout) who guides students taking general-education courses and a liaison in the university's Development Office (Brent Parkin), who is instrumental in obtaining donations and gifts. The College of Science Computer Specialist (Tyler Hardy) is available to assist with various computing needs. The College of Science Public Relations and Outreach Coordinator (Ali Miller) is available to help with web-site maintenance and other outreach activities.

Student workers are also integral to departmental support. Student employees benefit by being able to find employment in the Department of Zoology. Students performing discipline-related tasks (e.g. tutors, lab assistants) develop valuable skills. However, even for students in more general tasks, there are benefits:

- All student employees gain the benefit of convenience, by being able to work in proximity to their classrooms and other university resources. We expected this to improve their quality of life, which should indirectly improve their performance and ability to persist within the Zoology program.
- All student employees gain better familiarity with Zoology faculty and staff, which empowers them to understand the university, curriculum, research, etc.
- Not surprisingly, data from WSU Student Affairs (Jessica Oyler, personal communication) show a strong relation of employment on campus with persistence to graduation.

In addition, student employees commonly act as ambassadors for the Department.

Other zoology students (non-employees) also benefit from student employees. First, we hire tutors and supplemental instructors (SIs) to improve teaching effectiveness and provide guided study opportunities for students. Second, office and laboratory assistants provide additional access points for students to connect with the Department and gain assistance when needed.

Faculty and staff benefit from student employees as assistants and collaborators for varied tasks conducted within the Department. University- and College-level administrations continually task departments with new and more complicated responsibilities, including higher demands on paperwork and accounting for a variety of departmental procedures. However, reductions in other duties or

additional pay or opportunities for advancement rarely (if ever) accompany these cumulative, increasing demands.

Further, student employees strengthen morale by providing companionship and collegiality, as well as fresh, youthful perspectives that should be the hallmark of the college environment. Departmental staff appreciate having help and having someone to delegate to for various tasks. Faculty appreciate having additional assistance as needed and not having to place so many requests upon just the Administrative Specialist or Lab Manager. Overall, the Department runs much more smoothly and at a lower level of stress with the help of student employees.

List of Paid Zoology-Student Positions:

ZOOLOGY OFFICE ASSISTANT (FULLY FUNDED BY DEPARTMENT)
In addition to providing an extra set of hands to keep the department running smoothly, the Zoology Office Assistant is available to run errands so that the Administrative Specialist does not have to leave the front desk when something needs to be picked up elsewhere on campus. The Zoology Office Assistant provides extra support to faculty in making scans and copies, helps with special events such as major fest or annual awards. The Zoology Office Assistant is a smiling face at the front desk or on the phone when the Zoology Administrative Specialist needs to step away. The Zoology Office Assistant oversees office inventory and alerts the Administrative Specialist when supplies are running low. The assistant provides an extra pair of eyes for quality control on items such as room schedules and classroom schedules--those tasks that are repetitive and can prove difficult to spot errors when one has been looking at the documents too long. The assistant also provides an extra hand to the Zoology Lab Manager if the needs of the lab or special COS events require extra help.

ZOOLOGY LAB ASSISTANT (FULLY FUNDED BY DEPARTMENT)
The Zoology Lab Assistant helps set up labs for Principles of Zoology I and II, which include a variety of specimens and displays as well as dissections. The Lab Assistant helps with Human Physiology labs, making solutions, dissections, and setting up instruments. The assistant helps with Cell Biology and Genetics labs, which also include making solutions, taking care of the fruit fly colony, and setting up instruments. The Lab Assistant will also help with any other labs that are in need, wash glassware, and perform other general lab duties as requested.

The Zoology Lab Assistant helps the lab manager take care of live animals in the Department of Zoology, which include a number of fish tanks, a variety of reptiles, and rodents. The Lab Assistant helps maintain the animal facility by cleaning the facility and monitoring equipment. The Lab Assistant records animal care and maintenance activities on daily log.

JOB TITLE: ZOOLOGY EDUCATION ASSISTANT (FUNDED BY 50/50 PROGRAM)
The Zoology Education Assistant is in contact with a number of secondary schools in Box Elder, Weber, and Davis counties. He or She visits classrooms upon request and presents information according to their interests. Some examples include teaching a 3rd grade class about moths and butterflies, a 2nd grade class about Habitats and Adaptations, and a different 3rd grade class about Bones and Joints. These

presentations include a power point presentation and hands on displays. The Education Assistant recruits other Zoology student to help as needed. These included (but are not limited to) Zoology Club members and Teaching Assistants for Human Anatomy or Human Physiology. The Education Assistant also gives tours and presentations around the Department of Zoology when schools visit WSU. He or She also helps the Lab Assistant with laboratory preparation and animal care as needed.

JOB TITLE: STUDENT RESEARCH AIDE (FUNDED BY 50/50 PROGRAM)

The Student Research Aide helps in the Molecular Research (DNA) lab by preparing solutions, stocking supplies, autoclaving, maintaining equipment and instruments, and washing glassware. He or She also helps in the Organismal lab, helps the Lab Assistant and the Zoology Education Assistant with laboratory preparation, animal care, and outreach events.

JOB TITLE: SUPPLEMENTAL INSTRUCTORS (FUNDED BY SI PROGRAM)

The Supplemental Instruction Program provides Supplemental Instructors (SIs) for a number of the lower division, higher enrollment courses at no charge to the department (https://www.weber.edu/SupplementalInstruction).

Zoology courses with SIs:

- ZOOL 1010 – multiple sections
- ZOOL 1020 – multiple sections
- ZOOL 1110 – multiple sections
- ZOOL 1120
- ZOOL 2100 – multiple sections
- ZOOL 2200 – multiple sections
- ZOOL 3200 – multiple sections

JOB TITLE: ZOOLOGY COURSE TUTORS FOR DIFFICULT COURSES LACKING SIS (FULLY FUNDED BY DEPARTMENT)

Unfortunately, SIs are not available for all Zoology courses. In the interest of student success, we determined as a department to hire tutors that follow the same basic format as SIs for our more difficult courses lacking SIs. Initially, this was focused on Cell Biology (ZOOL 3200) and Genetics (ZOOL 3300), which are two of the most difficult courses in Zoology, but had never qualified for an SI. Eventually, Dr. Jon Clark was able to procure an SI for Zoology 3200 (see above), but the hiring of a tutor has continued for Genetics and has also been used for Comparative Physiology (ZOOL 3600).

JOB TITLE: WILDLIFE AND ORNITHOLOGY TEACHING ASSISTANT (FUNDED BY RELEASE TIME FOR DR. CAVITT FROM FACULTY SENATE)

The Wildlife and Ornithology Teaching Assistant helps Dr. Cavitt set up labs and exams for Wildlife Ecology and Conservation and Ornithology. The assistant also helps with field trips, including driving university vehicles so that more students can attend and so that students get more instruction during field trips then would be possible with a single instructor. Because Dr. Cavitt's combined teaching reductions with a four-hour course exceed his workload, the Wildlife and Ornithology Teaching Assistant provides him some relief and necessary assistance.

Adequacy of Facilities and Equipment

The Department is the primary user of one classroom in the Lind Lecture Hall (LL 130). The Department maintains the facilities in LL 130 including a projector hooked up to a computer and other audio-visual equipment. Most major general-education and introductory-major lecture courses are held in this room. When needed, larger lecture classrooms are available elsewhere in Lind Lecture Hall

The Department has priority access to four laboratory classrooms (one shared with Microbiology) and two laboratory preparation areas, all located on the 4th floor of Tracy Hall, adjacent to the area where the main Department office is located.

Models and specimens for laboratories are housed in a small room for specimen storage, storage areas, cabinets, and shelves in the preparation area, and cabinets and shelves in laboratory classrooms. Individual faculty members maintain fairly extensive collections of animals within their area of expertise including mammals, birds, reptiles, amphibians, fishes, and insects.

The Department has a teaching laboratory for Human Anatomy (Zool 2100) on the first floor of Tracy Hall. Laboratory sections for Human Anatomy run continuously on Tuesday, Wednesday, and Thursday, with lab sections occurring from 8 or 8:30 am to 4 or 4:30 pm. Students receive sophisticated anatomical training on cadavers that are in various stages of prosection and on other models.

The Department has an animal care and research facility on the first floor of Tracy Hall. It provides students and faculty with opportunity to conduct animal research following scientific, humane, and ethical principles. The facility includes three animal-housing rooms and a cage-wash area. One animal-housing room has an air-handling unit for 70 individually ventilated cages and a ventilated cabinet that allows multiple species to be held within one room and complies with housing standards required for USDA-covered species.

The Department also houses a DNA Laboratory on the fourth floor of Tracy Hall, which serves as a hi-tech teaching laboratory for Molecular Genetics (Zool 4300) as well as for some Genetics (Zool 3300) labs. The laboratory also facilitates student research projects in molecular genetics (a broad and burgeoning field). The DNA laboratory was largely funded initially through a National Science Foundation instrumentation grant with matching university funding. Thereafter, the Department and College have provided supplies and occasional equipment upgrades. This vital facility is a focal point for research and teaching of several faculty members.

Department faculty members not directly affiliated with the DNA lab are provided small research laboratory spaces on the fourth floor of Tracy Hall where they can house laboratory and field equipment along with computer facilities for scientific equipment and workspaces for student researchers. These laboratories have been outfitted over the years via equipment and funding sometimes available in the department, meager "startup" funds available to new faculty in some cases, grants received by faculty (internal and external), and excess or donated equipment from elsewhere. Each faculty member has been responsible for outfitting their own research space.

Department faculty members are also each provided an office space. Most offices are on the fourth floor of Tracy Hall, but three are on the third floor. The College of Science provides each individual with a new office computer every five years.

Adequacy of Library Resources

The Library's holdings are adequate to support the Zoology mission. There is money budgeted to buy new books annually and the availability of online journals is relatively good. The inter-library loan staff effectively and rapidly fulfills requests for resources not available on campus. The Library's science representative (Miranda Kispert) works closely with the Department to efficiently use resources available for subscriptions to biological resources, cancelling subscriptions that are little used and using "freed-up" resources to subscribe to other journals value more highly by Department faculty members. Miranda also sometimes provides library training for students and faculty members.

Standard G - Relationships with External Communities

Description of Role in External Communities

RELATIONSHIPS WITH PRIMARY & SECONDARY SCHOOLS

Department faculty and staff members support regional primary and secondary schools. The list that follows summarizes many interactions with schools, although it is not necessarily all inclusive.

Zoology Service to Primary & Secondary Schools by Faculty or Mentored Students

School	Service	Faculty Member	Year(s)
A-C Elementary, Chandlervill, IL	Field Expert	Cavitt	2014
Adelante Partnership	Campus visit	Marshall	2016
Avenues Preschool	Presentation	Skopec	2012
Box Elder High	Service Learning Projects	Zeveloff	2013
Box Elder High	Field Expert	Hoagstrom	2014-16
Box Elder Junior High	Life Skills Conference	Chung, Hoagstrom, Trask	2015-16
Brookwood Elementary	Multicultural Advancement of Science	Marshall	2016
Concurrent Enrollment Course Development – Biology 1010, Cells	Section chair	Chung	2013-2014
Creekside Elementary	Multicultural Advancement of Science	Marshall	2014
Family School Partnership	Science Liaison	Marshall	2012-2014
Freedom Elementary School	Presentation	Marshall	2012
George Washington High	Multicultural Advancement of Science	Marshall	2015
George Washington High	Field Expert	Trask	2015

Zoology Service to Primary & Secondary Schools by Faculty or Mentored Students

School	Service	Faculty Member	Year(s)
Jordan High School	Service Learning Projects	Zeveloff	2013
Kearns Junior High	Campus visit	Marshall	2016
Lincoln Elementary	Multicultural Advancement of Science	Marshall	2014
Midland Elementary	Field Expert	Cavitt	2014
Mound Fort Junior High	Presentation	Marshall	2012
Mountain View Elementary	Field Expert	Cavitt	2014
New Bridge Elementary	Computer-enhanced modeling lesson	Xiang	2016
NUAMES High	Campus visit	Meyers	2015-16
Ogden High	Student Mentor	Trask	2014
Parkland Elementary	Demonstrations	Chung	2014
Promontory Academy	Field Expert	Mull	2013
Ritchey Science and Engineering Fair	Judge recruiter	Chung	2014
Ritchey Science and Engineering Fair	Judge	Mull	2013-14
Ritchey Science and Engineering Fair	Judge	Berthélémy	2012-14
Saint Joseph's Catholic Schools	Board of Directors	Trask	2014
Saint Joseph's Catholic Schools	Aquinas Institute subcommittee member	Trask	2014
Science Olympiad	Event coordinator	Clark	2014
Science Olympiad	Event coordinator	Berthélémy	2014-16
Science Olympiad	Event coordinator	Mull	2016
Shadow Valley Elementary	Computer-enhanced modeling lesson	Xiang	2016
Snowcrest Junior High	Career Day Presentations	Mull	2013
Upward Bound Program	Multicultural Advancement of Science	Marshall	2014
Vae View Elementary	Multicultural Advancement of Science	Marshall	2014
Valley Elementary	Science Day Presentations	Mull	2013-14
Valley Elementary	Presentation	Mull	2013
Venture Academy	Board of Directors	Hoagstrom	2012-16
Venture Academy	Field Expert	Mull	2013-14
Venture Academy	Field Expert	Okazaki	2013
Wasatch Elementary	Field Expert	Cavitt	2014
Wasatch Elementary	Service Learning Projects	Zeveloff	2013
Wasatch Elementary	Teaching aid	Skopec	2013-15
Wasatch Elementary	Science Day	Skopec	2015

Zoology Service to Primary & Secondary Schools by Faculty or Mentored Students

School	Service	Faculty Member	Year(s)
Wasatch Elementary Backyard Bird Count	Field Expert	Cavitt	2013
Wasatch Elementary Shorebird Field Day	Field Expert	Cavitt	2012-13
Waterfall Canyon Academy	Multicultural Advancement of Science	Marshall	2016

PROFESSIONAL SERVICE BY FACULTY MEMBERS

Faculty members are commonly involved in organizations and events with links to biology and education. Many common activities are listed below, but this list is not necessarily all inclusive.

Zoology Involvement in External Communities by Faculty or Their Mentored Students, 2012-2016

Organization	Faculty	Year(s)
Antelope Island State Park Spider Festival co-organizer	Mull	2014-16
Association of Field Ornithologists Councilor	Cavitt	2013
Bear River Migratory Bird Refuge Board of Directors member, US Fish & Wildlife Service	Cavitt	2012-16
Bear River Migratory Bird Refuge Photo Contest Committee, US Fish & Wildlife Service	Cavitt	2014
Brigham Young University Thesis Committee Member	Cavitt	2012-13
Brigham Young University Dissertation Committee Member	Cavitt	2015-16
Community Foundation of Utah grantee	Cavitt	2015
Cross Charitable Foundation grantee	Cavitt	2012-13
Family School Partnership Science Liaison	Marshall	2012-15
Friends of Great Salt Lake article contribution	Cavitt	2014
Great Plains Landscape Conservation Cooperative grantee	Hoagstrom	2013-15
Great Salt Lake Audubon Society Presenter	Cavitt	2012
Great Salt Lake Bird Festival Presenter	Cavitt	2012-14
Great Salt Lake Ecosystem Project Technical Advisory Committee, Utah Division of Wildlife Resources	Cavitt	2014-16
Health Occupation Students of America	Chung	2013
International Science and Engineering fair judge	Trask	2015
Middle Rio Grande Conservancy District Conservation Action Plan advisory team member	Hoagstrom	2014
National Geographic Society grant reviewer	Marshall	2014
National Meeting of the National Association of Advisors for the Health Professions Western Regional representative, Planning Committee for 2014	Trask	2013-14
Nature Conservancy volunteer	Skopec	2015
New Mexico State University Thesis Committee Member	Hoagstrom	2012-14
Ogden Family Support Center President	Trask	2013-15
Ogden Migratory Bird Program Director	Cavitt	2012-16
Ogden Nature Center Advocate	Zeveloff	2013

Zoology Involvement in External Communities by Faculty or Their Mentored Students, 2012-2016

Organization	Faculty	Year(s)
Ogden Nature Center Board of Directors (vice chair 2015, chair 2016)	Hoagstrom	2012-17
Ogden Nature Center Earth Day activities	Mull	2014
Ogden Nature Center Creatures of the Night activities	Mull	2014
Ogden Nature Center Volunteer	Berthélémy	2012-15
Ogden Regional Hospital Institutional Review Board	Hoagstrom	2012-16
Ogden Standard Examiner newspaper article	Cavitt	2014
Rio Tinto/BirdLife International grantee	Cavitt	2012-14
S4 Science & Society Seminar Series presenter	Mull	2013
Sigma XI Board of Directors	Clark	2015-16
Sigma XI delegate	Clark	2014
Sigma XI Northwest Region Director	Clark	2015-16
Small Carnivore Specialist Group, Species Survival Commission, IUCN	Zeveloff	2012-14
South Dakota State University thesis advisor	Hoagstrom	2012-14
South Shore Avian Conservation Strategy Planning Team	Cavitt	2014-15
Summer International Undergraduate Research Experience at Great Salt Lake	Cavitt	2012-13
Summer Undergraduate Agricultural Biotechnology Research Experience collaborator	Marshall	2015-16
Texas Comptroller grand proposal reviewer	Hoagstrom	2014
Tracy Aviary grantee	Cavitt	2013-16
Tracy Aviary Research Exchange	Cavitt	2015
US Bureau of Reclamation grantee	Hoagstrom	2012-15
US Fish & Wildlife Service grantee	Skopec	2013-16
US Fish & Wildlife Service Project Leaders Meeting presenter	Skopec	2014
US Fish & Wildlife Service advisor	Mull	2014
US Forest Service collaborator	Mull	2014
US Geological Survey collaborator	Hoagstrom	2012-15
Universidad Autónoma de Baja California Sur, Mexico thesis committee member	Cavitt	2014
Universidad Autónoma de Nayarit thesis committee member	Cavitt	2013-15
University of Utah collaborator	Meyers, Skopec	2012-17

Zoology Involvement in External Communities by Faculty or Their Mentored Students, 2012-2016

Organization	Faculty	Year(s)
University of Utah dissertation committee member	Meyers	2012-14
Utah Audubon Society Strategic Planning Team	Cavitt	2014-15
Utah Division of Water Quality grantee	Cavitt	2013-16
Utah Division of Wildlife Resources volunteer	Zeveloff	2013
Utah Division of Wildlife Resources, Northern Region Fisheries collaborator	Hoagstrom	2014-16
Utah Division of Wildlife Resources Northern Region Regional Advisory Committee (vice chair 2014, chair 2015-16)	Cavitt	2012-16
Utah Education Network Science Fridays interview	Zeveloff	2012
Utah Linking Communities, Wetlands, & Migratory Birds, Executive Committee (chair 2014-15)	Cavitt	2012-15
Utah Partners for Conservation and Development grantee	Skopec	2013-15
Wake Forest University collaborator	Meyers	2016
Wasatch Audubon Presenter	Cavitt	2013
Weber Pathways – WSU hiking series coleader	Mull	2013
Western Hemispheric Shorebird Reserve Network Site Assessment Team Leader	Cavitt	2013
Wildlife Society Student subunit	Cavitt	2015-16
Youth Impact Multicultural Advancement of Science	Marshall	2016
Youth Impact Service-learning projects	Okazaki	2012-14

EXTERNAL COMMUNITY INVOLVEMENT FINANCIAL CONTRIBUTIONS TO THE DEPARTMENT OF ZOOLOGY

The Department of Zoology is fortunate to receive routine donations from several private sources (see table below). These donations are dedicated fund scholarships for Zoology students.

External Community Involvement Financial Contributions to the Department of Zoology

Organization	Type
Dr. Earl W. Smart Memorial Fund	Endowment
Orson Whitney Young Memorial Scholarship	Endowment
Zoology Department Gift Fund	Donation
Dr. Kent M. Van de Graaff Pre-medical Application Award Fund	Donation
Zoology Scholarship Fund	Donation

Summary of External Advisory Committee Minutes

Advisory Council Meeting
20 October, 2015, 1:00 pm – 4:30 pm
Meetings held: Union Building 404A

Committee Chair / Person Conducting: Dr. Christopher Hoagstrom

Recorder: Monica Linford

Attending: Bob Barrett, Leslie McFarlane, Jared Taylor, Brandon Albrecht, Paul Cowley, Ben Nadolski, Bob Obrien, Greg Nielson, Masako Wright, Ben Holcomb.

Guests: Student Presenters: Jill Dinsdale, Kirsten Peterson, Jessica DeJong, Kyle Spainhower, zoology major students attending panel discussion.

Absent: Deb Neal, Frank Howe, Karen McRae, Tim Brown, Lisa Oyler, Ann Neville
Handouts: Agenda, Draft Charter, Exit Survey

Welcome: Dr. Hoagstrom welcomed attendees

Question and answer period for Advisory Committee members.

Dr. Hoagstrom introduced Greg Nielson from Career Services, and invited members to share information pertinent to hiring needs.

Dr. Hoagstrom defined the purpose of the advisory committee as:

- Foster familiarity between AC Members and the Zoology Depart.
- Interact with students—make good connections.
- Make recommendations for courses to guide WSU in what students will need for job procurement in the future.

1. Advisory Committee was formed to foster partnerships between community entities, for whom graduates may work, and the WSU Zoology Department.
2. Advisory Committee is an important resource for non-premed/pre-vet zoology students.
3. Key Points of advice for students from AC Members

a. Understand the importance of a graduate degree.
b. Volunteer.
c. Get out in the community and make yourself known.
d. Be willing to relocate.
e. Emphasize math and chemistry.
f. Define your core values and beliefs and find a good fit between your values and your employment.
g. Understand that social and political issues and interpersonal skills are important in the workplace.
h. Be willing to cross-train in areas that are not necessarily what you studied in undergrad (e.g. law enforcement or grant writing).

Student Presentations:
Jill Dinsdale
"What's Eating Utah's Most Endangered Plant: The effects of herbivory on Clay Phacelia?"
Only 4 populations. Harsh environment steep, dry shale fragments. Invasive competitors. Conducted a "Weed Pull" project. Some of the only green material to eat in the winter. Tested herbivory, and trampling. Measured and monitored in person and by camera. Mule deer were the main issue with the plant. Problem may be related to snow pack since the plant receives less cover when snowfall is low. Currently observing effects of herbivory exclusion (apparatus that prevent animals eating the plant).

Kyle Spainhower:
"Fiber Composition and Tail Muscle Function in Birds." Morphology Lab run by Dr. Myers. Uses Microdissection and immunohistochemistry, photo-microscopy. Explore tail morphology of birds. Looking at slow fibers and fast fibers. Quantify tail muscle fiber populations. Determine a relationship between bird species. Preliminary data suggests that all samples contained mixed fiber populations. Slow fibers possibly contribute to stability in Northern Flicker. Plan to look at other woodpecker species to validate preliminary conclusions.

Jessica deJong:
Brine Shrimp are important to migratory bird populations, and aqua culture. Easily reared in a small space. I helped Dr. Berthélémy with a Roundup® study. Plan for tissue specific level of Se. Currently, Se is tested in bird eggs. What if Se is affecting the brine shrimp? Test fertility, had some birth defects in the control group. Did stress tests. Detected DNA damage. Found that I like field work as a result of this research.

Panel Discussion Introductions:
- Bob O'Brien: Retired from Department of Water Quality
- Bob Barrett (USFWS): Twenty eight years of experience. Manager at Bear River Migratory Bird Refuge. Comment: "I'm surprised to find that Weber State is so large. We benefit from your students conducting research at the refuge. I think that this group will be beneficial to your students."
- Leslie McFarlane (DWR): Twenty five years of experience working with the state agency. Started out volunteering answering phones, picking up road-kill, doing what others didn't want to do. This shows your work ethic. Then took temporary jobs that led to permanent employment. WSU Alumnus
- Ben Nadolski (DWR): Zoology Minor from WSU with Criminal Justice Major. Started with volunteer and temporary positions. Moved into the policy side of the agency.
- Paul Cowley (USFS): Twenty one years of experience with Forest Service. Formerly worked for Nez Perce Reservation. Currently Staff Officer at Forest Service.
- Jared Taylor: Principal of Venture Academy Charter High School. Holds an MA in Curriculum Instruction. WSU Alumnus.
- Brandon Albrecht: Owner/Manager of BIO-WEST Inc. environmental consulting firm. His firm works with private companies, state agencies and federal agencies conducting environmental research (e.g. aquatic and fishery research).
- Masako Wright (BLM): Bureau of Land Management. Worked her way up in the agency with a BS degree.

- Ben Holcomb (DWQ): Division of Water Quality “Bio-assessment Plan Coordinator.” Designs plans to determine whether water areas are meeting expectations. Recently took on the new responsibility of “Harmful Algal Bloom Coordinator.” Previously worked at Nez Perce reservation.

Standard H – Program Summary

Results of Previous Program Reviews – in the last program review (2012-2013), no problems were identified.

The Program Review Committee endorsed the plans of action set forth by the Department in "faculty response to program review" document, with the following specific recommendations:

1	*Strategic shifting of course offerings to meet student demand*
	2013-14: increased offerings in Principles of Zoology I (ZOOL 1110), Cell Biology (ZOOL 3200), and Genetics (ZOOL 3300); limiting upper-division offerings to four courses that provide diverse options but ensure adequate enrollment per course
	2014-15: increased offerings in Principles of Zoology I (ZOOL 1110), Cell Biology (ZOOL 3200), and Genetics (ZOOL 3300); limiting upper-division offerings to four courses that provide diverse options but ensure adequate enrollment per course
	2015-16: monitoring enrollments and waitlists in all Zoology courses
	2016-17: monitoring enrollments and waitlists in all Zoology courses; attempted to offer 5 upper-division electives and meet demand for other courses
	2017-18: more rigorously assessed scheduling courses to avoid important conflicts; Fall 2017 more successfully offered 5 upper-division electives, still meeting demand for other courses
2	*Maintenance of a diversity of upper-division offerings (see also recommendation 3 below)*
	2013-18: alternating course offerings by semester; polling student interest in courses; tracking enrollment levels
3	*Continued support of faculty interest in upper-division courses (see also recommendation 2 above)*
	2013-14: re-introduction of Endocrinology (ZOOL 4220) into course rotation; all faculty interest in upper-division supported
	2014-15: all faculty interest in upper-division supported
	2015-16: new courses: Teaching Human Anatomy Lab (ZOOL 3099), Advanced Human Anatomy (ZOOL 3100), Human Physiology Lab Teaching Assistant (ZOOL 4820); Field Zoology (ZOOL 4950) offered; all faculty interest in upper-division supported
	2016-17: Parasitology (ZOOL 4500) offered for first time in years; re-introduction of Biology of Cancer (ZOOL 4900) into course rotation; Short Course in Zoology (ZOOL 4920) offered; all faculty interest in upper-division supported
	2017-18: maintained rotation of diverse courses;
4	*Continued support of faculty interest in interdisciplinary efforts*
	2013-18: all faculty interest in interdisciplinary efforts supported

5	*Continued support of faculty interest in undergraduate research*
	2013-18: all faculty interest in undergraduate research supported • For example, all proposals for undergraduate research supported
6	*Department faculty and the Dean are encouraged to work together, along with the rest of the College of Science in support of a long-term, strategic plan.*
	2013-18: Department strategic plan completed in 2016; the chair has collaborated with the Dean in strategic planning for the College

Action Plan for Ongoing Assessment Based on Current Self Study Findings

Action Plan for Evidence of Learning Related Findings

Problem Identified	Action to Be Taken
Assessment data needed for almost all non-general educations courses in major	2018-2023: Continue to emphasize need for assessment data; collect data for as many courses as possible
Assessment data needed for graduates	2018-2023: Devise plan for assessing graduates, such as in a standardized test for Zoology majors

Action Plan for Staff, Administration, or Budgetary Findings

No problems identified

APPENDIX – Assessment Data, 2016-2017

Evidence of Learning **Courses within the Major**
Course: ZOOL 2100
Terms: Fall 2015 to Spring 2017 (4 terms)
Sections: Six sections taught between Fall Semester 2015 and Spring Semester 2017

Zoology Learning Outcome	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Cellular organization. All living things consist of one or more cells, the units of structure, function, and reproduction.	Students will demonstrate their understanding by performance answering exam questions.	A set of 44 exam questions	Combined student performance of 65% or higher	Combined student performance was 75%	Students understand cellular organization	No changes needed
Structure and Function. There is a relationship between molecular and organismal structure and function.	Students will demonstrate their understanding by performance answering exam questions.	A set of 214 exam questions	Combined student performance of 65% or higher	Combined student performance was 80%	Students understand structure and function	No changes needed
System regulation. Biological systems are governed by chemical transformations and homeostasis.	Students will demonstrate their understanding by performance answering exam questions.	A set of 52 exam questions	Combined student performance of 65% or higher	Combined student performance was 79%	Students understand system regulation	No changes needed
The process of science. Students will use observational strategies to test hypotheses and critically evaluate experimental evidence.	Students will demonstrate their understanding by performance answering exam questions.	A set of 199 exam questions	Combined student performance of 65% or higher	Combined student performance was 80%	Students understand the process of science	No changes needed
Communication. Students will explain scientific concepts to different audiences and work collaboratively to explore biological problems.	Students will demonstrate their understanding by performance answering exam questions.	A set of 53 exam questions	Combined student performance of 65% or higher	Combined student performance was 80%	Students understand communication	No changes needed

Evidence of Learning **Courses within the Major**
Course: ZOOL 3600
Term: Spring 2017
Sections: One section taught in Spring Semester 2017

Evidence of Learning: Courses within the Major					
Outcome	Method of Measurement*	Threshold	Findings	Interpretation	Action Plan
Learning Outcome: Evolution	Method 1: 12 essay exam questions graded with scoring guide Method 2: Lab activity with full lab report write up graded using a rubric	Method 1: Class average >72% Method 2: Class average >72%	Method 1: Class average was 83% Method 2: Class average was 81%	Students are able to discuss how evolutionary forces have shaped animals physiology	Continue use of assessments
Learning Outcome: Cellular Organization	Method 1: 14 essay exam questions graded with scoring guide Method 2: Lab activity with full lab report write up graded using a rubric	Method 1: Class average >72% Method 2: Class average >72%	Method 1: Class average was 80% Method 2: Class average was 81%	Students are able to collect, analyze and/or discuss data about cellular function	Continue use of assessments
Learning Outcome: Genetics	Method 1: 5 essay exam questions graded with scoring guide Method 2: Lab activity with full lab report write up graded using a rubric	Method 1: Class average >72% Method 2: Class average >72%	Method 1: Class average was 84% Method 2: Class average was 81%	Students are able to are able to collect, analyze and/or discuss data on how genetic changes/differences alter the physiology of animals	Continue use of assessments
Learning Outcome: Ecosystems	Method 1: 18 essay exam questions graded with scoring guide Method 2: Two lab activities with full lab report write ups graded using a rubric	Method 1: Class average >72% Method 2: Class average >72%	Method 1: Class average was 80% Method 2: Class average was 80%	Students are to collect, analyze and/or discuss data on physiological adaptations of animals to their environment and how physiology determines the environments animals are able to live in	Continue use of assessments
Learning Outcome: Structure and function	Method 1: 32 essay exam questions graded with scoring guide Method 2: Lab activity with full lab report write up graded using a rubric	Method 1: Class average >72% Method 2: Class average >72%	Method 1: Class average was 82% Method 2: Class average was 81%	Students are to collect, analyze and/or discuss data on how differences in protein expression lead to differences in cellular function which lead to differences in physiology	Continue use of assessments

Learning Outcome: Systems regulation	Method 1: 35 essay exam questions graded with scoring guide Method 2: Two lab activities with full lab report write ups graded using a rubric Method 3: Two lab activities with worksheets involving data analysis and interpretation graded using a rubric	Method 1: Class average >72% Method 2: Class average >72% Method 3: Class average >72%	Method 1: Class average was 82% Method 2: Class average was 80% Method 3: Class average was 91%	Students are to collect, analyze and/or discuss data on how animals maintain homeostasis despite changes in their internal or external environments	Continue use of assessments
Learning Outcome: The process of science	Method 1: 31 essay exam questions where figures had to be interpreted graded with scoring guide Method 2: Three hypothesis driven lab activities with full lab report write ups graded using a rubric Method 3: Two hypothesis driven lab activities with worksheets involving data analysis and interpretation graded using a rubric	Method 1: Class average >72% Method 2: Class average >72% Method 3: Class average >72%	Method 1: Class average was 84% Method 2: Class average was 80.5% Method 3: Class average was 91%	Students are able to generate as well as test hypotheses. Students are able to collect and evaluate data as well interpret and evaluate already collected data.	Continue use of assessments

Learning Outcome: Quantitative reasoning	Method 1: 12 essay exam questions where students had to calculate answers or make figures graded with scoring guide. Method 2: Four lab activities with full lab report write ups graded using a rubric Method 3: Three lab activities with worksheets involving data analysis and interpretation graded using a rubric	Method 1: Class average >72% Method 2: Class average >72% Method 3: Class average >72%	Method 1: Class average was 84% Method 2: Class average was 83% Method 3: Class average was 93%	Students are able to analyze physiological data statistically and display data graphically.	Continue use of assessments
Learning Outcome: Communication	Method 1: Three presentations with different formats graded by peer-review using a rubric Method 2: Lab activity where students collected data in groups and wrote a group lab report.	Method 1: Class average >72% Method 2: Class average >72%	Method 1: Class average was 84% Method 2: Class average was 81%	Students can effectively communicate scientific information at different levels and can work collaboratively.	Continue use of assessments
Learning Outcome: Science and society	Method 1: Lab activity assessing effect of commonly consumed foods on blood glucose levels with worksheet that has essay questions about role of dietary choices on diabetes prevention/treatment. Graded using a rubric.	Method 1: Class average >72%	Method 1: Class average was 92%	Students can effectively collect and analyze data that can be used to address a societal problem.	Continue use of assessment

*Direct and indirect: at least one measure per objective must be a direct measure.

Evidence of Learning **Courses within the Major**
Course: ZOOL 4640
Term: Summer 2017
Sections: One section taught in Summer Semester 2017

Zoology Learning Outcome	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Evolution. The diversity of life is the result of mutation, adaptation, and selection pressure over time.	Students will demonstrate their understanding by performance answering exam questions.	A set of exam questions	70% of students achieving 70% competency	Combined student performance was 84%	Students understand evolution	No changes needed
Ecosystems. All organisms are interconnected, interacting with each other as well as with their dynamic environment.	Students will demonstrate their understanding by performance answering exam questions.	A set of exam questions	70% of students achieving 70% competency	Combined student performance was 92%	Students understand ecosystems	No changes needed
Structure and Function. There is a relationship between molecular and organismal structure and function.	Students will demonstrate their understanding by performance answering exam questions.	A set of exam questions	70% of students achieving 70% competency	Combined student performance was 80%	Students understand structure and function	No changes needed
	Students will demonstrate their understanding by assembling an insect collection.	Insect collection		Combined student performance was 93%		

Evidence of Learning **Courses within the Major**
Course: ZOOL 4680
Term: Spring 2017
Sections: One section taught in Spring Semester 2017

Evidence of Learning: Courses within the Major					
Outcome	Method of Measurement*	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Learning Outcome: Evolution	Method 1: 20 essay exam questions graded with a scoring guide Method 2: Lab activity involving phylogeny construction	Method 1: Class average >72% Method 2: Class average >72%	Method 1: Class average was 86% Method 2: Class average was 92%	Students are able to recognize, discuss and construct evolutionary relationships between mammals	Continue use of assessments
Learning Outcome: Genetics	Method 1: 6 essay questions graded with a scoring grid. Method 2: Lab activity involving phylogeny construction using genetic sequences.	Method 1: Class average >72% Method 2: Class average >72%	Method 1: Class average was 84% Method 2: Class average was 92%	Students are able to discuss and utilize genetic information to explain relationships between and evolution of mammals.	Continue use of assessments
Learning Outcome: Ecosystems	Method 1: 13 essay exam questions graded with a scoring guide Method 2: Multi-week lab activity developing, implementing and evaluating methods to quantify the density and diversity of mammals at the Ogden Nature Center graded via rubrics and peer-review	Method 1: Class average >72% Method 2: Class average >72%	Method 1: Class average was 88% Method 2: Class average was 91%	Students are able to recognize, discuss and evaluate the role of mammals in ecosystems	Continue use of assessments
Learning Outcome: Structure and function	Method 1: 19 essay exam questions graded with a scoring guide Method 2: Lab activities involving specimen identification using dichotomous keys with worksheets graded using a rubric Method 3: Multi-week lab project digitizing mammal collection graded using self and peer-review rubrics	Method 1: Class average >72% Method 2: Class average >72% Method 3: Class average >72%	Method 1: Class average was 89% Method 2: Class average was 92% Method 3: Class average was 92%	Students are able to recognize structural differences between mammals and discuss the functional consequences.	Continue use of assessments

Learning Outcome: Systems regulation	Method 1: 9 essay exam questions graded with a scoring guide	Method 1: Class average >72%	Method 1: Class average was 92%	Students are able to discuss how mammals maintain homeostasis despite changes to their internal and external environments.	Continue use of assessments
Learning Outcome: The process of science	Method 1: Multi-week lab activity done in groups developing, implementing and evaluating methods to quantify the density and diversity of mammals at the Ogden Nature Center graded via rubrics and peer-review	Method 1: Class average >72%	Method 1: Class average was 92%	Students are able to pose hypotheses, develop methods to test hypotheses, troubleshoot methodological challenges and analyze and interpret data.	Continue use of assessments
Learning Outcome: Quantitative reasoning	Method 1: Multi-week lab activity done in groups developing, implementing and evaluating methods to quantify the density and diversity of mammals at the Ogden Nature Center graded via rubrics and peer-review	Method 1: Class average >72%	Method 1: Class average was 92%	Students are able to collect, analyze and display data in figures.	Continue use of assessments
Learning Outcome: Communication	Method 1: Four presentations with different formats graded by peer-review using a rubric. Method 2: Multi-week lab activity done in groups developing, implementing and evaluating methods to quantify the density and diversity of mammals at the Ogden Nature Center graded via rubrics and peer-review	Method 1: Class average >72% Method 2: Class average >72%	Method 1: Class average was 94% Method 2: Class average was 92%	Students can effectively communicate scientific information at different levels and can work collaboratively.	Continue use of assessments

Learning Outcome: Science and society	Method 1: Multi-week lab activity developing, implementing and evaluating methods to quantify the density and diversity of mammals at the Ogden Nature Center graded via rubrics and peer-review Method 2: Multi-week lab project digitizing mammal collection to create a digital collection that could be accessed by outside groups graded using self and peer-review rubrics	Method 1: Class average >72% Method 2: Class average >72%	Method 1: Class average was 91% Method 2: Class average was 92%	Students are able to collaboratively work to collect data for dissemination to community partners.	Continue use of assessments

Evidence of Learning: **General Education, Life Science Courses**
Course: ZOOL 1010
Term: Fall 2016
Sections: Data are combined for two sections taught in Fall Semester 2016 (*n* = 72 students)

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Nature of Science. Scientific knowledge is based on evidence that is repeatedly examined, and can change with new information. Scientific explanations differ fundamentally from those that are not scientific.	Students will demonstrate their understanding by performance answering exam questions focused on the nature of science.	A set of 45 multiple choice questions	Combined student performance of 65% or higher	Combined student performance was 86%	Students understand the nature of science	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Integration of Science All natural phenomena are interrelated and share basic organizational principles. Scientific explanations obtained from different disciplines should be cohesive and integrated.	Students will demonstrate their understanding by performance answering exam questions focused on the integration of science.	A set of 48 multiple choice questions	Combined student performance of 65% or higher	Combined student performance was 78%	Students understand the integration of science	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Science & Society The study of science provides explanations that have significant impact on society, including technological advancements, improvement of human life, and better understanding of human and other influences on the earth's environment.	Students will demonstrate their understanding by performance answering exam questions focused on science and society.	A set of 21 multiple choice questions	Combined student performance of 65% or higher	Combined student performance was 78%	Students understand the role of science in society	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Problem Solving & Data Analysis Science relies on empirical data, and such data must be analyzed, interpreted, and generalized in a rigorous manner.	Students will demonstrate their understanding by performance answering exam questions focused on problem solving and data analysis.	A set of 9 multiple choice questions	Combined student performance of 65% or higher	Combined student performance was 72%	Students understand problem solving and data analysis	No changes needed
		One problem-solving essay question	Combined student performance of 65% or higher	Combined student performance was 89%		

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Levels of Organization All life shares an organization that is based on molecules and cells and extends to organisms and ecosystems.	Students will demonstrate their understanding by performance answering exam questions focused on levels of organization.	A set of 57 multiple choice questions	Combined student performance of 65% or higher	Combined student performance was 67%	Students understand levels of organization	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Metabolism and homeostasis: Living things obtain and use energy, and maintain homeostasis via organized chemical reactions known as metabolism.	Students will demonstrate their understanding by performance answering exam questions focused on metabolism and homeostasis.	A set of 32 multiple choice questions	Combined student performance of 65% or higher	Combined student performance was 71%	Students understand metabolism and homeostasis	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Genetics and evolution: Shared genetic processes and evolution by natural selection are universal features of all life	Students will demonstrate their understanding by performance answering exam questions focused on genetics and evolution.	A set of 114 multiple choice questions	Combined student performance of 65% or higher	Combined student performance was 73%	Students understand genetics and evolution	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Ecological interactions: All organisms, including humans, interact with their environment and other living organisms.	Students will demonstrate their understanding by performance answering exam questions focused on ecological interactions.	A set of 84 multiple choice questions	Combined student performance of 65% or higher	Combined student performance was 81%	Students understand ecological interactions	No changes needed

Evidence of Learning: **General Education, Life Science Courses**
Course: ZOOL 1020
Terms: Fall 2016 & Spring 2017
Sections: Data are combined for two sections, one taught in Fall Semester 2016 & another in Spring Semester 2017

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Nature of Science. Scientific knowledge is based on evidence that is repeatedly examined, and can change with new information. Scientific explanations differ fundamentally from those that are not scientific.	Students will demonstrate their understanding by performance answering exam questions focused on the nature of science.	A set of 21 multiple choice questions	Combined student performance of 65% or higher	Combined student performance was 75%	Students understand the nature of science	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Integration of Science All natural phenomena are interrelated and share basic organizational principles. Scientific explanations obtained from different disciplines should be cohesive and integrated.	Students will demonstrate their understanding by performance answering exam questions focused on the integration of science.	A set of 40 multiple choice questions	Combined student performance of 65% or higher	Combined student performance was 71%	Students understand the integration of science	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Science & Society The study of science provides explanations that have significant impact on society, including technological advancements, improvement of human life, and better understanding of human and other influences on the earth's environment.	Students will demonstrate their understanding by performance answering exam questions focused on science and society.	A set of 42 multiple choice questions	Combined student performance of 65% or higher	Combined student performance was 82%	Students understand the role of science in society	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Problem Solving & Data Analysis Science relies on empirical data, and such data must be analyzed, interpreted, and generalized in a rigorous manner.	Students will demonstrate their understanding by performance answering exam questions focused on problem solving and data analysis.	A set of 10 multiple choice questions	Combined student performance of 65% or higher	Combined student performance was 74%	Students understand problem solving and data analysis	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Levels of Organization All life shares an organization that is based on molecules and cells and extends to organisms and ecosystems.	Students will demonstrate their understanding by performance answering exam questions focused on levels of organization.	A set of 72 multiple choice questions	Combined student performance of 65% or higher	Combined student performance was 74%	Students understand levels of organization	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Metabolism and homeostasis: Living things obtain and use energy, and maintain homeostasis via organized chemical reactions known as metabolism.	Students will demonstrate their understanding by performance answering exam questions focused on metabolism and homeostasis.	A set of 24 multiple choice questions	Combined student performance of 65% or higher	Combined student performance was 75%	Students understand metabolism and homeostasis	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Genetics and evolution: Shared genetic processes and evolution by natural selection are universal features of all life	Students will demonstrate their understanding by performance answering exam questions focused on genetics and evolution.	A set of 42 multiple choice questions	Combined student performance of 65% or higher	Combined student performance was 80%	Students understand genetics and evolution	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Ecological interactions: All organisms, including humans, interact with their environment and other living organisms.	Students will demonstrate their understanding by performance answering exam questions focused on ecological interactions.	A set of 28 multiple choice questions	Combined student performance of 65% or higher	Combined student performance was 86%	Students understand ecological interactions	No changes needed

Evidence of Learning: **General Education, Life Science Courses**
Course: ZOOL 1110
Term: Fall 2016
Sections: One section taught in Fall Semester 2016 (*n* = 77 students)

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Nature of Science. Scientific knowledge is based on evidence that is repeatedly examined, and can change with new information. Scientific explanations differ fundamentally from those that are not scientific.	Students will demonstrate their understanding by performance answering exam questions focused on the nature of science.	A set of 50 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 86%	Students understand the nature of science	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Integration of Science All natural phenomena are interrelated and share basic organizational principles. Scientific explanations obtained from different disciplines should be cohesive and integrated.	Students will demonstrate their understanding by performance answering exam questions focused on the integration of science.	A set of 52 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 76%	Students understand the integration of science	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Science & Society The study of science provides explanations that have significant impact on society, including technological advancements, improvement of human life, and better understanding of human and other influences on the earth's environment.	Students will demonstrate their understanding by performance answering exam questions focused on science and society.	A set of 41 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 86%	Students understand the role of science in society	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Problem Solving & Data Analysis Science relies on empirical data, and such data must be analyzed, interpreted, and generalized in a rigorous manner.	Students will demonstrate their understanding by performance answering exam questions focused on problem solving and data analysis.	A set of 183 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 81%	Students understand problem solving and data analysis	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Levels of Organization All life shares an organization that is based on molecules and cells and extends to organisms and ecosystems.	Students will demonstrate their understanding by performance answering exam questions focused on levels of organization.	A set of 30 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 87%	Students understand levels of organization	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Metabolism and homeostasis: Living things obtain and use energy, and maintain homeostasis via organized chemical reactions known as metabolism.	Students will demonstrate their understanding by performance answering exam questions focused on metabolism and homeostasis.	A set of 90 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 74%	Students understand metabolism and homeostasis	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Genetics and evolution: Shared genetic processes and evolution by natural selection are universal features of all life	Students will demonstrate their understanding by performance answering exam questions focused on genetics and evolution.	A set of 136 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 86%	Students understand genetics and evolution	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Ecological interactions: All organisms, including humans, interact with their environment and other living organisms.	Students will demonstrate their understanding by performance answering exam questions focused on ecological interactions.	A set of 143 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 85%	Students understand ecological interactions	No changes needed

Evidence of Learning: **General Education, Life Science Courses**
Course: ZOOL 1110
Term: Spring 2017
Sections: One section taught in Spring Semester 2017 (*n* = 62 students)

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Nature of Science. Scientific knowledge is based on evidence that is repeatedly examined, and can change with new information. Scientific explanations differ fundamentally from those that are not scientific.	Students will demonstrate their understanding by performance answering exam questions focused on the nature of science.	A set of 51 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 84%	Students understand the nature of science	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Integration of Science All natural phenomena are interrelated and share basic organizational principles. Scientific explanations obtained from different disciplines should be cohesive and integrated.	Students will demonstrate their understanding by performance answering exam questions focused on the integration of science.	A set of 93 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 78%	Students understand the integration of science	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Science & Society The study of science provides explanations that have significant impact on society, including technological advancements, improvement of human life, and better understanding of human and other influences on the earth's environment.	Students will demonstrate their understanding by performance answering exam questions focused on science and society.	A set of 42 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 83%	Students understand the role of science in society	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Problem Solving & Data Analysis Science relies on empirical data, and such data must be analyzed, interpreted, and generalized in a rigorous manner.	Students will demonstrate their understanding by performance answering exam questions focused on problem solving and data analysis.	A set of 93 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 82%	Students understand problem solving and data analysis	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Levels of Organization All life shares an organization that is based on molecules and cells and extends to organisms and ecosystems.	Students will demonstrate their understanding by performance answering exam questions focused on levels of organization.	A set of 75 multiple & matching choice questions	Combined student performance of 65% or higher	Combined student performance was 80%	Students understand levels of organization	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Metabolism and homeostasis: Living things obtain and use energy, and maintain homeostasis via organized chemical reactions known as metabolism.	Students will demonstrate their understanding by performance answering exam questions focused on metabolism and homeostasis.	A set of 60 multiple choice 7 matching questions	Combined student performance of 65% or higher	Combined student performance was 74%	Students understand metabolism and homeostasis	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Genetics and evolution: Shared genetic processes and evolution by natural selection are universal features of all life	Students will demonstrate their understanding by performance answering exam questions focused on genetics and evolution.	A set of 136 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 82%	Students understand genetics and evolution	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Ecological interactions: All organisms, including humans, interact with their environment and other living organisms.	Students will demonstrate their understanding by performance answering exam questions focused on ecological interactions.	A set of 95 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 81%	Students understand ecological interactions	No changes needed

Evidence of Learning: **General Education, Life Science Courses**
Course: ZOOL 1370
Term: Spring 2017
Sections: One section taught in Spring Semester 2017 (*n* = 17 students)

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Nature of Science. Scientific knowledge is based on evidence that is repeatedly examined, and can change with new information. Scientific explanations differ fundamentally from those that are not scientific.	Students will demonstrate their understanding by performance answering exam questions focused on the nature of science.	A set of 7 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 67%	Students understand the nature of science	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Integration of Science All natural phenomena are interrelated and share basic organizational principles. Scientific explanations obtained from different disciplines should be cohesive and integrated.	Students will demonstrate their understanding by performance answering exam questions focused on the integration of science.	A set of 4 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 54%	Students understand the integration of science	Questions will be increased & improved

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Science & Society The study of science provides explanations that have significant impact on society, including technological advancements, improvement of human life, and better understanding of human and other influences on the earth's environment.	Students will demonstrate their understanding by performance answering exam questions focused on science and society.	A set of 20 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 57%	Students understand the role of science in society	Questions will be increased & improved

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Problem Solving & Data Analysis Science relies on empirical data, and such data must be analyzed, interpreted, and generalized in a rigorous manner.	Students will demonstrate their understanding by performance answering exam questions focused on problem solving and data analysis.	A set of 34 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 58%	Students understand problem solving and data analysis	Questions will be improved

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Levels of Organization All life shares an organization that is based on molecules and cells and extends to organisms and ecosystems.	Students will demonstrate their understanding by performance answering exam questions focused on levels of organization.	A set of 39 multiple & matching choice questions	Combined student performance of 65% or higher	Combined student performance was 64%	Students understand levels of organization	Questions will be improved

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Metabolism and homeostasis: Living things obtain and use energy, and maintain homeostasis via organized chemical reactions known as metabolism.	Students will demonstrate their understanding by performance answering exam questions focused on metabolism and homeostasis.	A set of 45 multiple choice 7 matching questions	Combined student performance of 65% or higher	Combined student performance was 61%	Students understand metabolism and homeostasis	Questions will be improved

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Genetics and evolution: Shared genetic processes and evolution by natural selection are universal features of all life	Students will demonstrate their understanding by performance answering exam questions focused on genetics and evolution.	A set of 63 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 62%	Students understand genetics and evolution	Questions will be improved

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Ecological interactions: All organisms, including humans, interact with their environment and other living organisms.	Students will demonstrate their understanding by performance answering exam questions focused on ecological interactions.	A set of 38 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 57%	Students understand ecological interactions	Questions will be improved

Evidence of Learning: **General Education, Life Science Courses**
Course: ZOOL 2200
Term: Fall 2016
Sections: One section taught in Fall Semester 2016

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Nature of Science. Scientific knowledge is based on evidence that is repeatedly examined, and can change with new information. Scientific explanations differ fundamentally from those that are not scientific.	Students will demonstrate their understanding by performance answering exam questions focused on the nature of science.	A set of 14 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 91%	Students understand the nature of science	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Integration of Science All natural phenomena are interrelated and share basic organizational principles. Scientific explanations obtained from different disciplines should be cohesive and integrated.	Students will demonstrate their understanding by performance answering exam questions focused on the integration of science.	A set of 85 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 80%	Students understand the integration of science	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Science & Society The study of science provides explanations that have significant impact on society, including technological advancements, improvement of human life, and better understanding of human and other influences on the earth's environment.	Students will demonstrate their understanding by performance answering exam questions focused on science and society.	A set of 45 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 81%	Students understand the role of science in society	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Problem Solving & Data Analysis Science relies on empirical data, and such data must be analyzed, interpreted, and generalized in a rigorous manner.	Students will demonstrate their understanding by performance answering exam questions focused on problem solving and data analysis.	A set of 49 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 83%	Students understand problem solving and data analysis	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Levels of Organization All life shares an organization that is based on molecules and cells and extends to organisms and ecosystems.	Students will demonstrate their understanding by performance answering exam questions focused on levels of organization.	A set of 176 multiple & matching choice questions	Combined student performance of 65% or higher	Combined student performance was 77%	Students understand levels of organization	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Metabolism and homeostasis: Living things obtain and use energy, and maintain homeostasis via organized chemical reactions known as metabolism.	Students will demonstrate their understanding by performance answering exam questions focused on metabolism and homeostasis.	A set of 235 multiple choice 7 matching questions	Combined student performance of 65% or higher	Combined student performance was 77%	Students understand metabolism and homeostasis	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Genetics and evolution: Shared genetic processes and evolution by natural selection are universal features of all life	Students will demonstrate their understanding by performance answering exam questions focused on genetics and evolution.	A set of 26 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 82%	Students understand genetics and evolution	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Ecological interactions: All organisms, including humans, interact with their environment and other living organisms.	Students will demonstrate their understanding by performance answering exam questions focused on ecological interactions.	A set of 35 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 73%	Students understand ecological interactions	No changes needed

Evidence of Learning: **General Education, Life Science Courses**
Course: ZOOL 2200
Term: Spring 2017
Sections: One section taught in Spring Semester 2017

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Nature of Science. Scientific knowledge is based on evidence that is repeatedly examined, and can change with new information. Scientific explanations differ fundamentally from those that are not scientific.	Students will demonstrate their understanding by performance answering exam questions focused on the nature of science.	A set of 54 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 85%	Students understand the nature of science	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Integration of Science All natural phenomena are interrelated and share basic organizational principles. Scientific explanations obtained from different disciplines should be cohesive and integrated.	Students will demonstrate their understanding by performance answering exam questions focused on the integration of science.	A set of 128 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 84%	Students understand the integration of science	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Science & Society The study of science provides explanations that have significant impact on society, including technological advancements, improvement of human life, and better understanding of human and other influences on the earth's environment.	Students will demonstrate their understanding by performance answering exam questions focused on science and society.	A set of 57 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 87%	Students understand the role of science in society	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Problem Solving & Data Analysis Science relies on empirical data, and such data must be analyzed, interpreted, and generalized in a rigorous manner.	Students will demonstrate their understanding by performance answering exam questions focused on problem solving and data analysis.	A set of 62 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 83%	Students understand problem solving and data analysis	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Levels of Organization All life shares an organization that is based on molecules and cells and extends to organisms and ecosystems.	Students will demonstrate their understanding by performance answering exam questions focused on levels of organization.	A set of 125 multiple & matching choice questions	Combined student performance of 65% or higher	Combined student performance was 80%	Students understand levels of organization	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Metabolism and homeostasis: Living things obtain and use energy, and maintain homeostasis via organized chemical reactions known as metabolism.	Students will demonstrate their understanding by performance answering exam questions focused on metabolism and homeostasis.	A set of 205 multiple choice 7 matching questions	Combined student performance of 65% or higher	Combined student performance was 80%	Students understand metabolism and homeostasis	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Genetics and evolution: Shared genetic processes and evolution by natural selection are universal features of all life	Students will demonstrate their understanding by performance answering exam questions focused on genetics and evolution.	A set of 10 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 88%	Students understand genetics and evolution	No changes needed

Gen Ed Learning Goal	Measurable Learning Outcome	Measure	Threshold	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Ecological interactions: All organisms, including humans, interact with their environment and other living organisms.	Students will demonstrate their understanding by performance answering exam questions focused on ecological interactions.	A set of 26 multiple choice & matching questions	Combined student performance of 65% or higher	Combined student performance was 82%	Students understand ecological interactions	No changes needed