2018-2019 Assessment Results for Graduate Students

Department of Animal and Range Sciences

Lance McNew and Sarah McCoski

The Department of Animal and Range Sciences (hereafter "department") offers a Master of Science degree in Animal & Range Sciences and a Doctor of Philosophy degree in Animal & Range Sciences. Both the M.S. and Ph.D. degrees require that the student choose either an Animal Science emphasis or a Range Science emphasis. In addition, Ph.D. students may opt to enroll in the interdisciplinary Ecology and Environmental Sciences degree program. Ph.D. students enrolled in this degree program are affiliated with a home department that corresponds to that of their major faculty advisor, and are required to meet standard departmental requirements.

Department faculty met during the Spring of 2018 to formulate a plan to assess the department's graduate program. A final plan was approved in May of 2018 and immediately implemented. As required by the plan, the department is required to report on assessment activities and critically evaluate the department's graduate program. The following documents serve as our assessment for the time period January 2018 – August 2019.

The Department identified the following desired learning outcomes for graduate students completing Master of Science and Ph.D. degrees:

For M.S. students:

1. Conduct research resulting in an original thesis or dissertation
2. Demonstrate mastery of subject content knowledge and research/critical inquiry methodology
3. Demonstrate effective written communication of substantive content
4. Demonstrate effective oral communication of substantive content
5. Be able to conduct scholarly or professional activities in an ethical manner

For Ph.D. students:

1. Produce and defend an original significant contribution to knowledge
2. Demonstrate mastery of subject content knowledge and research/critical inquiry methodology
3. Demonstrate excellence in written communication of substantive content
4. Demonstrate excellence in oral communication of substantive content
5. Be able to conduct scholarly and professional activities in an ethical manner
6. Demonstrate professionalization into the field of study as demonstrated through publications, presentations, funded fellowships, professional association activities, professional experience, etc.

To evaluate departmental success in meeting desired learning outcomes, we collected student data from the following sources:

<u>Student Performance: Data Sources</u>

M.S. Programs

		Outcomes				
Data Source		1	2	3	4	5
Departmental Records[1]		X				
Thesis/thesis defense[2]			X	X	X	X
ARNR 507: Research Methods				X	X	
Ethics training in responsible conduct of research[3]						X

Ph.D. Programs

		Outcomes					
		1	2	3	4	5	6
Departmental records[1]		X					
Qualifying exam			X	X			
Dissertation/dissertation defense[2]			X	X	X	X	
ARNR 507: Research Methods				X	X		
Ethics training in responsible conduct of research[3]						X	
C.V.[4]							X

[1] Program will track thesis/dissertation defenses and calculate success rates. [2] The rubrics for outcomes 1–4 are to be completed at the thesis/dissertation defense. If departments prefer, they may use comprehensive exams rather than the actual dissertation, thesis, or paper. These rubrics will not be used to assess or evaluate individual students and will not inform the decision regarding whether a student passes a defense or course. The data will be aggregated for all students in the program over a two-year period in order to assess the success of the program in meeting its program learning outcomes (see sample rubric attached). [3] The rubric for outcome 5 is the completion of some ethics training. [4] C.V.s of students will be collected as they complete their degrees. The C.V. will be used to provide evidence of appropriate professional activities to the particular field of study (these may be published papers, research training, teaching development, presentations at conferences, etc. as is appropriate for your discipline or program and as was identified in learning outcome 6 above).

Results:

During January 2017 – August 2019, 17 M.S. and 3 Ph.D. students attempted to defend graduate degrees. All graduate students were successful. Five M.S. students withdrew from the graduate program during the reporting period. Six Ph.D. students successfully completed comprehensive exams.

M.S. Students

Learning Outcome 1: Conduct research resulting in an original thesis or dissertation.

During January 2017 – August 2019, 17 students attempted to defend an M.S. thesis describing original research; all 17 produced an original thesis and successfully defended. Graduate students successfully defending theses and earning M.S. degrees during January 2017 – August 2017 are listed in Table 1.

Learning Outcome 2: Demonstrate mastery of subject content knowledge and research/critical inquiry methodology

Beginning in 2018, graduate student advisory committees completed a *Thesis and Defense Assessment* (Appendix A), where each member of the graduate supervisory committee ranked the student's performance relative to the learning outcome from 1 (Unacceptable) to 4 (Exceeds standards). Scores were tabulated and averages calculated for each student. Assessments were completed for eleven M.S. students defending during January 2018—August 2019.

The mean (± SD) score relative to Learning Outcome 2 was 3.4 (0.6). Ten (10) of 11 students received average scores ≥3, indicating that 91% of the M.S. students defending during January 2018 – August 2019 met departmental standards relative to the learning outcome. Thus, we exceeded the departmental response threshold that ≥ 80% of M.S. students will be ranked at a 3–4 level in subject content knowledge.

Learning Outcome 3: Demonstrate effective written communication of substantive content

Learning Outcome 3 was assessed using two data sources. First, graduate student supervisory committees completed a *Thesis and Defense Assessment* (Appendix A), where each member of the graduate supervisory committee ranked the student's performance relative to the learning outcome from 1 (Unacceptable) to 4 (Exceeds standards). The second data set in composed of writing assignments provided by graduate students as part of ARNR 507: Research Methods. Each semester of course offering, two members of the faculty who were not the primary instructor for the course scored a random sample of writing assignments from students taking the class for the second or third time (i.e., near the end of their graduate program). We used the rubric presented in Appendix B to evaluate students relative to the learning outcome.

The mean (± SD) score collected by graduate committees at defenses relative to Learning Outcome 3 was 3.1 (0.5). Eight (8) of 11 students received average scores of ≥3, indicating that 73% of the M.S. students met departmental standards relative to the learning outcome. During January–August 2018, we did not meet our response threshold that ≥ 80% of students will be ranked at a 3–4 level in written communication.

The Graduate Assessment Committee independently evaluated the writing assignments of five M.S. students enrolled in their second semester of ARNR 507. Students were ranked based on four criteria and average scores (e.g., 1 = unacceptable, 4 = exceeds standards) across criteria calculated for each student. Average writing scores for M.S. students was 3.1 (0.5). Four of 5 students evaluated had overall scores ≥3, indicating that 80% of students sampled met departmental standards for effective written communication.

Learning Outcome 4: Demonstrate effective oral communication of substantive content

Learning Outcome 4 was assessed using two data sources. First, graduate student supervisory committees completed a *Thesis and Defense Assessment* (Appendix A), where each member of the graduate supervisory committee ranked the student's performance relative to the learning outcome from 1 (Unacceptable) to 4 (Exceeds standards). The second data set in composed of independent evaluations of oral presentations given by graduate students as part of ARNR 507: Research Methods. Each semester of course offering, two members of the faculty who were not the primary instructor for the course scored a random sample of writing assignments from students taking the class for the second or third time (i.e., near the end of their graduate program). We used the rubric presented in Appendix C to evaluate students relative to the learning outcome.

The mean (± SD) score collected by graduate advisory committees at M.S. defenses relative to Learning Outcome 4 was 3.5 (0.5). All 11 M.S. students defending during the reporting period received average scores of ≥3, indicating that 100% of the M.S. students met departmental standards relative to proficiency in oral communication.

The Graduate Assessment Committee independently evaluated the oral presentations of 7 M.S. students enrolled in ARNR 507 during the January 2018 – May 2019). Average (SD) scores for effectiveness in the oral communication of student research was 3.6 (0.3). All 7 students (100%) students received overall oral presentation scores ≥3.0 (range = 3.1–3.9).

Overall, both lines of evidence indicate that the department met the desired response threshold of M.S. student proficiency in oral communication.

Learning Outcome 5: Be able to conduct scholarly or professional activities in an ethical manner

All students received training in scientific ethics as part of ARNR 507. In addition, graduate student supervisory committees completed a *Thesis and Defense Assessment* (Appendix A),

where each member of the graduate supervisory committee ranked the student's performance relative to the learning outcome from 1 (Unacceptable) to 4 (Exceeds standards).

The mean (± SD) score collected by graduate committees at defenses relative to Learning Outcome 5 was 3.7 (0.5). All 11 students defending during the reporting period received average scores of ≥ 3, indicating that 100% of the M.S. students defending during 2018—2019 met departmental standards relative to ethical scholarly and professional activities.

Ph.D. Students

Learning Outcome 1: Produce and defend an original significant contribution to knowledge

During 2017–2018, three students attempted to defend a Ph.D. thesis describing original research, all of which (100%) produced an original dissertation and successfully defended. Graduate students successfully defending dissertations and earning doctoral degrees during January 2017 – August 2017 were Omolola Betiku, Neto Garcia, and Samuel Wyffels (Table 1).

Learning Outcome 2: Demonstrate mastery of subject content knowledge and research/critical inquiry methodology

Beginning in 2018, graduate student advisory committees completed a *Thesis and Defense Assessment* (Appendix A), where each member of the graduate supervisory committee ranked the student's performance relative to the learning outcome from 1 (Unacceptable) to 4 (Exceeds standards). Scores were tabulated and averages calculated for each student. Assessments were completed for two Ph.D. students defending during January 2018—August 2019.

The mean (± SD) score relative to Learning Outcome 2 was 3.4 (0.6). Both students received average scores ≥3, indicating that 100% of the doctoral students defending during January 2018 – August 2019 met departmental standards relative to the learning outcome. Thus, we met our departmental response threshold that ≥ 80% of students will be ranked at a 3–4 level in subject content knowledge.

Learning Outcome 3: Demonstrate effective written communication of substantive content

Learning Outcome 3 was assessed using two data sources. First, graduate student supervisory committees completed a *Thesis and Defense Assessment* (Appendix A), where each member of the graduate supervisory committee ranked the student's performance relative to the learning outcome from 1 (Unacceptable) to 4 (Exceeds standards). The second data set in composed of writing assignments provided by graduate students as part of ARNR 507: Research Methods. Each semester of course offering, two members of the faculty who were not the primary instructor for the course scored a random sample of writing assignments from students taking the class for the second or third time (i.e., near the end of their graduate program). We used the rubric presented in Appendix B to evaluate students relative to the learning outcome.

The mean (± SD) score collected by graduate committees at defenses relative to Learning Outcome 3 was 3.3 (0.3). Both Ph.D. students (100%) defending during 2018-2019 received average scores of ≥3.

The Graduate Assessment Committee independently evaluated the writing assignments of three Ph.D. students enrolled in their second semester of ARNR 507. Students were ranked based on four criteria and average scores (e.g., 1 = unacceptable, 4 = exceeds standards) across criteria calculated for each student. Average writing scores for Ph.D. students was 3.8 (0.3). All three students evaluated had scores ≥3, indicating that 100% of students met departmental standards for effective written communication.

Learning Outcome 4: Demonstrate effective oral communication of substantive content

Learning Outcome 4 was assessed using two data sources. First, graduate student supervisory committees completed a *Thesis and Defense Assessment* (Appendix A), where each member of the graduate supervisory committee ranked the student's performance relative to the learning outcome from 1 (Unacceptable) to 4 (Exceeds standards). The second data set in composed of independent evaluations of oral presentations given by graduate students as part of ARNR 507: Research Methods. Each semester of course offering, two members of the faculty who were not the primary instructor for the course scored a random sample of writing assignments from students taking the class for the second or third time (i.e., near the end of their graduate program). We used the rubric presented in Appendix C to evaluate students relative to the learning outcome.

The mean (± SD) score collected by graduate committees at defenses relative to Learning Outcome 4 was 3.4 (0.4). Both students defending during the reporting period received average scores of ≥3, indicating that 100% of the Ph.D. students met departmental standards relative to proficiency in oral communication based on graduate committee assessment.

During three semesters of ARNR 507 (spring 2018 & 2019, fall 2019), we evaluated the oral presentations of two Ph.D. students. Average scores for effectiveness in the oral communication of student research was 3.4 (0.4). Both (100%) students received overall average scores ≥3.0.

Overall, both lines of evidence indicate that the department met the desired response threshold of Ph.D. student proficiency in oral communication.

Learning Outcome 5: Be able to conduct scholarly or professional activities in an ethical manner

All students received training in scientific ethics as part of ARNR 507. In addition, graduate student supervisory committees completed a *Thesis and Defense Assessment* (Appendix A), where each member of the graduate supervisory committee ranked the student's performance relative to the learning outcome from 1 (Unacceptable) to 4 (Exceeds standards).

The mean (± SD) score collected by graduate committees at defenses relative to Learning Outcome 5 was 3.7 (0.1). Both students defending during the reporting period received average scores of ≥ 3, indicating that 100% of the Ph.D. students defending during 2018—2019 met departmental standards relative to ethical scholarly and professional activities.

Learning Outcome 6: Demonstrate professionalization into the field of study as demonstrated through publications, presentations, funded fellowships, professional association activities, professional experience, etc.

The curriculum vitae of two Ph.D. students were collected after their doctoral defense and evaluated for evidence of professionalization into their field of study.

Publications: On average, Ph.D. students published 1 publication in peer-reviewed and 5 other scientific/professional journals associated with their field of study.

Presentations: On average, students presented 4 scientific papers at professional and scientific meetings.

Funded scholarships, fellowships, grants, etc.: On average, students were awarded 0 scholarships and fellowships, and received 2 grants for conducting research in their field of study.

Activities associated with professional associations: The two Ph.D. students demonstrated active participation in professional societies. Both students professionalized into employment in their respective fields of study after completing their doctoral degrees.

Overall, graduate advisors should encourage graduate students to join and actively participate in professional societies and present their research at professional conferences. Because publishing in peer-reviewed journals is a lengthy process, evaluation of professionalization based on publication of research will require revised methodology to track students post-graduation.

Conclusions & Recommendations

The Department of Animal & Range Sciences awarded 17 M.S. and 3 Ph.D. degrees during January 2017 – August 2018. The department met desired response thresholds for 4 of 5 learning outcomes identified in our *Graduate Program Assessment Plan* for students in our M.S. degree during the reporting period. Two lines of evidence used to evaluate Learning Outcome 3 suggested we are close to meeting our targeted response threshold for effectiveness in written communication; evaluations completed by graduate student advisory committees indicated that 8 of 11 (73%) students evaluated met targeted standards in writing effectiveness, whereas independent evaluation of the writing assignments of a sample of M.S. students by the Graduate Assessment Committee indicated that 4 of 5 students (80%) met targeted standards.

The department's *Graduate Program Assessment Plan* mandates that a faculty response is required when an acceptable performance standard has not been met, and a strategy

developed to improve areas where the performance standard has not been met. Possible responses include:

1. Gather additional data during the following review period to verify or refute the results.
2. Change something in the curriculum or program to try to improve performance.
3. Develop or select an alternative performance datum to assess outcome.
4. Change the acceptable performance threshold (must provide reasoning behind such a strategy).

The Graduate Assessment Committee recommends Option 1 as results were based on a relatively small sample of M.S. students. Nevertheless, overall low scores in Learning Outcome 3 (effectiveness in written communication) relative to other Learning Outcomes suggest program improvements in the training of scientific writers.

Only three students completed Ph.D. degrees in our graduate program during 2017–2019. Two of these students were included in this graduate program assessment; data were not available for one student who defended and graduated prior to the implementation of the departmental *Graduate Assessment Plan* in May 2018. The department met desired response thresholds for 6 of 6 learning outcomes identified in our *Graduate Program Assessment Plan* for students in our Ph.D. degree during January 2018 – August 2019.

Table 1. List of graduate students enrolled in the Department of Animal & Range Sciences, Montana State University

Year	Name	Degree	Pass/Fail/Withdrew
2017	Elkins, Eric	MS	Pass
	Herryger, Melissa	MS	Pass
	Betiku, Omolola	PhD	Pass
	Cover, Cayce	MS	Withdrew
	Staudenmeyer, Danielle	MS	Pass
	Wells, Smith	MS	Pass
	Hubbard, Ashton	MS	Pass
	McGregor, Ian	MS	Pass
	Page, Chad	MS	Pass
2018	Blatter, Sarah	MS	Pass
	Payne, Jarrett	MS	Pass
	Ritter, Tory	MS	Pass
	Sapkota, Anish	MS	Pass
	Vold, Skyler	MS	Pass
	Johnson, Brittani	MS	Pass
	Garcia, Neto	PhD	Pass
	Williams, Alyson	MS	Pass
	Arias, Carlos	MS	Withdrew
	Mueller, Anna Luka	MS	Withdrew
2019	Knuth, Ryan	MS	Pass
	Pulliam, John	MS	Pass
	Kurzen, Mark	MS	Pass
	Wyffels, Sam	PhD	Pass
	Bauer, Rory	MS	Withdrew
	Chulyak, Victoria	MS	Withdrew
Comprehensive Exams			
2016	Betiku, Omolola	PhD	Pass
2017	Garcia, Neto	PhD	Pass
	Wyfells, Samuel	PhD	Pass
2018	Milligan, Megan	PhD	Pass
2019	Hieber, Jordan	PhD	Pass
	Eiseman, Krista	PhD	Pass

APPENDIX A. Rubric for graduate assessment

1. Graduate advisors will complete the *Thesis / Dissertation and Defense Assessment* following an attempted graduate student defense.

    4 = Exceeds Standards: Student demonstrates competent performance exceeding normal standards at either the M.S. or Ph.D. level.
    3 = Meets Standards: Student demonstrates appropriate performance for professionalization
    2 = Below Standards: Student does not demonstrate the skills commensurate with M.S. or Ph.D. degree.
    1 = Unacceptable: Performance is clearly inadequate. Student demonstrates an inability or unwillingness to develop appropriate skills.

Thesis / Dissertation and Defense Assessment (score each component 1-4)	Score
Demonstrates mastery of subject content knowledge and research/critical inquiry methodology	
Demonstrates effective written communication of their study	
Demonstrates effective oral presentation of their study	
Conducted study and professional activities during their program in an ethical manner	
Average score	

Appendix B: Rubric for Assessment of Learning Outcome 3: Effectiveness in written communication of substantive content
4 = Exceeds Standards: Student demonstrates competent performance exceeding normal standards at either the M.S. or Ph.D. level.
3 = Meets Standards: Student demonstrates appropriate performance for professionalization
2 = Below Standards: Student does not demonstrate the skills commensurate with M.S. or Ph.D. degree.
1 = Unacceptable: Performance is clearly inadequate. Student demonstrates an inability or unwillingness to develop appropriate skills.

Indicators of Effective Written Communication of Substantive Content	1	2	3	4	Score
Style / Organization	Paper is poorly written and reveals a lack of effort suitable for a graduate student	Paper conveys appropriate ideas, but reveals weak control over diction, syntax, and organization.	Effective command of sentence structure and diction. Paper is organized in a logical scientific manner	Excellent command of sentence structure, diction, and organization is appropriate for subject matter content	
Content	Major omissions necessary for scientific paper.	Some necessary components of an effective paper missing or poorly described.	Good job presenting ideas; contains all necessary content for scientific paper, but not as clear or succinct as it could be.	Clearly presents appropriate justification, objectives and methods; If available, results are complete and inferences follow from the data	
Grammar	Weak grammar, spelling	Several grammar and spelling errors	Few spelling and grammar errors	No spelling or grammar mistakes	
Sources	Poorly sourced	Some major relative literature not covered	Major relative literature discussed	Exhaustive literature presented	

Appendix C: Rubric for Assessment of: Effectiveness in oral communication of substantive content (Learning Outcome 4)

4 = Exceeds Standards: Student demonstrates competent performance exceeding normal standards at either the M.S. or Ph.D. level.
3 = Meets Standards: Student demonstrates appropriate performance for professionalization
2 = Below Standards: Student does not demonstrate the skills commensurate with M.S. or Ph.D. degree.
1 = Unacceptable: Performance is clearly inadequate. Student demonstrates an inability or unwillingness to develop appropriate skills.

Indicators of Effective Oral Communication of Substantive Content	1	2	3	4	Score
Organization	Poor	Insufficient	Adequate	Presentation is arranged logically	
Content	Omission of critical information necessary for a scientific presentation	Missing key components of effective presentation	Most components covered, but talk would benefit from additional information	Material presented was complete and appropriate, all key components covered	
Clarity	Study justification, objectives, and methods unclear; demonstrated lack of preparation	Slides poorly arranged or improperly formatted. Font size too small, too crowded, inappropriate color scheme, overuse of acronyms and jargon	Presentation is relatively clear; some slides too busy or lacking; visual aids are well designed, legible, with appropriate content	Presentation is succinct and clear; avoids jargon and acronyms; visual aids are well designed, legible, with appropriate content	

Knowledge & Understanding	Demonstrates poor knowledge of the materials presented	Demonstrates a lack of knowledge in critical components of the study (e.g., literature, study design, analyses)	Demonstrates solid understanding of the topic and associated literature; highlights important points where study is strongest; delivers effective conclusion	Demonstrates a superb grasp of the topic and the literature related to the topic; well prepared for questions; Revisits important and relative points	
Delivery	Obvious ill-preparedness	Ineffective delivery; poor speech mechanics; nervous habits interfered with effective presentation	Effective delivery; appropriate volume, few nervous habits, relatively little reliance on notes; evidence of preparation	Outstanding delivery; engagement with audience, little reliance on notes, smooth transitions	