

# Student Learning Outcomes Assessment Summary

## ***Statistics, MS***

*College of Natural Science and Mathematics*

**2015-2016, 2016-2017**

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### **1. Assessment information collected**

- A. Statistical methodology mastery
  - a. Exit level: Students' research projects or theses are examined by all members of the statistics faculty.
  - b. Alumni: Career progress information from program graduates is maintained
- B. Statistical theory mastery
  - a. Exit level: Students' comprehensive exams, both written and oral, are evaluated by all members of the statistics faculty.
  - b. Alumni: Career progress information from program graduates is maintained and exit surveys are administered to students following graduation.
- C. Consulting skill mastery
  - a. Exit level: Students' performance in the consulting seminar is evaluated by the faculty member in charge of the seminar.
  - b. Alumni: Career progress information from program graduates is maintained
- D. Communication skill mastery:
  - a. Exit level: Students' written research projects or theses provide demonstration of written communication skills. The oral portion of their comprehensive exams provides demonstration of oral communication skills.

### **2. Conclusions drawn from the information summarized above**

- A. Statistical methodology mastery
  - a. Exit level: Students' achievement of classical methods, as evidenced by their research projects, has been deemed to be adequate by the statistics faculty during the reporting period. However, given the quick

pace at which statistics is evolving, we believe that not all students who finish the program may have had sufficient exposure to new, cutting-edge methods.

- b. Alumni: The summary of alumni career information in Appendix 2 suggests that graduates are well-positioned to obtain and succeed in data-analytic jobs.

B. Statistical theory mastery

- a. Exit level: Students' theoretical achievement, as evidenced by their comprehensive exams, has been deemed to be adequate by the statistics faculty during the reporting period. Although all students miss questions on the exam, there does not seem to be a specific trend in these mistakes that would suggest some component of the theory course sequence needs to be changed.
- b. Alumni: Again, the summary of alumni career information in Appendix 2 suggests there are no program deficits in statistical theory preparation. The exit survey results from Appendix 1 also indicate that the theory component of the program is functioning well. But they also suggest that the methodological component of the program might be deficient in the rigor of program electives and that the consulting skill component of the program might be deficient in the amount of consulting experience students receive.

C. Consulting skill mastery

- a. Exit level: Students' consulting achievement, as evidenced by their graded performance in the consulting seminar, has been deemed to be adequate by faculty members running the seminar during the reporting period. Specifically, students have demonstrated an ability to ask probing questions of an investigator in order to understand a problem and then propose principled solutions. They have, to at least some extent, each shown an understanding of the iterative nature of consultation and the necessity of engaging in a two-way dialogue with those they consult. We view this achievement as a minimum standard for effective consulting.
- b. Alumni: As noted in Appendix 2, many graduates end up in careers that involve a large amount of formal or informal consulting (such as biometricians with government agencies). In light of the comments mentioned in the exit survey, noted above, we conclude that the consulting seminar piece of the program is very valuable to many students, and any consulting activities that happen in other courses are likewise worthwhile.

D. Communication skill mastery

- a. Exit level: All students that have taken comprehensive exams during the reporting period have demonstrated good oral communication skills.

Most students have required many revisions of their written projects during the reporting period. Often multiple faculty members have needed to make repeated and extensive reviews before project write-ups have become satisfactory. In some cases this difficulty can be partially attributed to students being non-native English speakers. In every case, it can be partially attributed to the fact that technical writing is inherently difficult and can only be mastered through hands-on practice. Ultimately, all students have satisfied the program faculty that written communication skills were sufficient to warrant graduation.

**3. Curricular changes resulting from conclusions drawn above**

A. Statistical methodology mastery

We have altered the program requirements to explicitly include STAT F401 (Regression and Analysis of Variance) as an admissions requirement (as of Fall 2018) in order to ensure that no students complete the program without this course; students who are accepted into the program without STAT F401 or its equivalent are required to take the course as a deficiency.

Moreover, we have begun discussions that may result in a reorganization of the material covered in some of the elective courses, including STAT F621 (Distribution-free statistics), so that some additional modern methods may be covered. No specific curricular changes have resulted from these discussions as of yet.

It is unclear at this point whether the exit survey respondents' concerns about program electives being too easy apply only to courses taught outside the department or also to our own courses. Owing to this ambiguity and the small sample size of the exit survey, we decline to make any changes to program elective options for now. We will continue to be mindful of this issue, however.

B. Statistical theory mastery

None

C. Consulting skill mastery

The consulting seminar is offered every spring semester and each student is required to take one semester of it. We are currently discussing proposals to strengthen the consulting experience that students graduate with, such as

requiring that students take two semesters of it instead of one or implementing a grading policy that raises the level of participation required for a passing grade.

- D. Communication skill mastery  
None

**4. Identify the faculty members involved in reaching the conclusions drawn above and agreeing upon the curricular changes resulting**

Ron Barry  
Julie McIntyre  
Margaret Short  
Scott Goddard  
Leah Berman

**5. Has your SLOA plan been updated to include assessment of the program's Communication Plan, as required by Faculty Senate motion? (required for baccalaureate programs only)**

Not applicable, since this is a Master's degree program.

## Appendix 1: Exit survey with responses

1. Please respond to each of the following statements with

1 = strongly agree; 2 = agree; 3 = neutral; 4 =disagree; 5 = strongly disagree

Please feel free to write comments on any of these questions.

a) I would recommend the statistics MS degree program to others. \_1\_1\_2\_

b) The quality of instruction by statistics faculty is excellent. \_1\_1\_2\_

c) The core statistics courses (STAT 651, 652, 653) provided a solid foundation. \_1\_1\_2\_

d) I had access to modern computing equipment and statistics software. \_1\_1\_1\_

e) Statistics faculty members were accessible and involved in my education. \_1\_1\_2\_

f) I learned a lot in completing the MS project. \_1\_1\_1\_

g) Sufficient elective courses were offered. \_1\_2\_1\_

h) Statistics elective courses were at an appropriately challenging level. \_1\_3\_4\_

i) Degree requirements were well communicated. \_1\_1\_1\_

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2. Please provide a narrative response to each of the following:

a) How should the statistics MS program be changed to improve it?

*The courses in our statistics department were strongly theory focused, which is just fine because we were able to take courses for specific areas of concentration as elective courses. One thing I suggest is to offer the consulting seminar every semester instead of only in spring semesters. I took both theory courses and (quantitative) fishery courses, but I still felt I was lacking the bridging part between biological research and statistics theory. I have been helping a couple of UAF graduate students. Both just had a thesis defense this month. I'm sure there are many students in other department who want to use our consulting seminar class, and that it helps students in the statistics program to learn the application of statistics. Offering the seminar class in fall semesters may not be realistic, but I think providing information about the consulting seminar class to new statistics students will be great. I wish I attended the seminar class in my first year as well.*

*Personally, I would have benefited from database training (SQL and intro to database management software). That's not really proper stats stuff, but I use it in my position constantly.*

*It's a lot of work to ask that an instructor teach split-level (stats-program/non-stats-program) for an elective course that could only have 6 students in it, but the stats students are required to have a strong math and basic stat background. They can benefit from more rigorous electives. I would strongly discourage the stats students from taking electives from instructors outside the program. Many of us go into roles that are "consultants" to some degree. The advising class was very low-key, given that this might be a primary role for many graduates of the program. Identifying appropriate study questions, statistical objectives, power analysis via simulation, and dealing with messy data that was not collected with an analytical approach in mind are activities agency biometricians must confront regularly. Here, I'll speak for my agency, but the biometricians are often looked to as the "critical thinkers" for all sorts of activities outside of analyses.*

b) What components of the statistics MS program worked particularly well?

*Spatial statistics and scientific sampling are directly related to my everyday work. Our core courses (theory I, II, and III) and Bayesian class are definitely beneficial. My graduation project was a big help for me getting the job for which I went back to school. Every single experience in the program worked very well.*

*All of the modeling work and data visualization were really beneficial to me. Ways of thinking about data and analysis have proved valuable (step-by-step analysis; keeping in mind the big picture, obvious things even when you get deep in the data weeds). The mathematical stats stuff is also great and necessary to know when you are learning new skills. Also, the tools learned from the journal reading seminar we did with Margaret have been put to good use.*

*The theory classes were essential to building a level of competency that allows me to address new and unfamiliar analytical techniques. The rigor of these classes should be preserved and strengthened.*

**Appendix 2: Current career status of all graduates since 2013, as far as we have been able to track**

<b>Employer class</b>	<b>Position type</b>	<b>Count</b>
Government agency	Biometrician	5
	Statistician	1
	Analyst	2
University	PhD Student	4
	Analyst	2
For-profit business	Analyst	1
	Database manager	1
Research institution	Data scientist	1
	Unknown	1
Unknown	Unknown	1