

# Student Learning Outcomes Assessment Summary

## **Mathematics, BA/BS**

CNSM

2014-15, 2015-16

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This document contains a combined assessment of the Mathematics BA and BS. These programs are identical in all respects from the point of view of the Department of Mathematics and Statistics and differ only regarding the non-mathematics general education requirements for the degree. All but one student discussed here completed a BS. One student is near completion of a BA with a double major in Economics. The BA in mathematics exists so that such students can complete a double major instead of a double degree.

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

#### **ETS Major Field Test**

In order to assess our students' mastery of core curriculum, the department administers a standardized test, the ETS Major Fields Test, to seniors enrolled in our capstone courses, the Senior Seminar and the Statistics Consulting Seminar.

In the two-year period under review all ten students enrolled in these capstone classes took the Major Fields Test in Mathematics. Both years saw similar results on the exam and we summarize here the pooled numbers.

Performance was consistent with the very strong results our department has achieved on this test in the past. Two of our students obtained the highest possible score on the exam and placed in the top 5% of students nationwide<sup>1</sup>. Another four students placed in the top 16% of examinees and three of the remaining four students placed in the top 50%. Overall, our department ranked in the 97<sup>th</sup> percentile of institutions taking this exam.

In addition to overall institution scores, the exam reports a breakdown of performance in five categories. In each of Calculus, Algebra, Routine Problems, and Non-Routine Problems, our program scored in the top 94-97% of reporting institutions. In Applied Problems, our weakest category, we scored in the 88<sup>th</sup> percentile.

<sup>1</sup> Scoring in the top n% means that we did better than (100-n)% of tracked US institutions. So a score in the top 5% means that we did better than 95% of reporting institutions.

## Exit Surveys

In order to monitor student experience in the program, and to gather data on post-graduation plans, students in the capstone Senior Seminar and Statistics Consulting Seminar are administered an Exit Survey.

A total of nine surveys were gathered during the current two-year reporting cycle. There was a failure to gather surveys in 2014-15 and efforts made after the fact recovered 3 of 5 possible surveys. In 2015-16 a full suite of 6 surveys were gathered. This is not the first time that we have experienced deficiencies in our off-year data gathering and we make concrete recommendations below on steps to take to ameliorate these shortcomings.

Six of nine respondents report intent to continue on to graduate school, with three of these intending to attend a UAF statistics or mathematics program. Of the remaining three students, one is a principal developer in a software startup, one is seeking mathematics related work (without listing a prospective employer) and one is working in a field unrelated to mathematics.

The survey asks students to list classes they found beneficial, those that were not, and topics they felt were missing from their experience.

**Most Beneficial:** Three or more students listed Real Analysis, Abstract Algebra, and Linear Algebra, and a broad variety of courses were listed by one or two students.

**Least Beneficial:** No commonality, aside from three surveys that responded "none".

**Missing Topics:** Topology and Number Theory appeared three times each with no other topic mentioned more than once.

Students were asked the extent to which they felt the program prepared them in five core topic areas: Calculus, Proofs, Abstract Algebra, Linear Algebra, and Real Analysis. All students agreed or strongly agreed that they felt well prepared in these topics, with the exception of one student reporting neutral agreement concerning Calculus and one transfer student who responded N/A to all of these topics. Nearly all students strongly agreed that they were well prepared in Calculus and in Proofs. The one student reporting a weak background in Calculus provided additional feedback: he took Calculus II in the summer and found it to be deficient.

Students were asked the about their satisfaction in four areas: advising, elective offerings, course scheduling, and instructional quality. A majority of students strongly agreed they were satisfied with instruction quality, with the remainder agreeing.

Regarding elective offerings and course scheduling, the majority of students agreed they were satisfied with the remainder responding 'neutral'. The advising category was bimodal with a majority strongly agreeing they were satisfied, but three students had a neutral or 'disagree' response.

### **Post Graduation Follow-up**

An attempt was made to contact past graduates from years 2014, and 2015 to determine their current career activities. Faculty members were consulted as needed as part of these efforts. Of the 13 students who graduated in the period Summer 2014 through Fall 2015, 9 students responded to our emails.

Two graduates worked in software development (Microsoft, Amazon). One is contemplating a graduate degree in CS and the other has already started one.

One is completing a secondary education program and will be attending a masters program in mathematics.

One works as a claims adjuster and is studying for entry-level actuary exams.

One has completed a MS in Statistics and is enrolling in a PhD program.

One works as a scientific technician (Terrasond).

One works as an engineering technician for the State of Alaska and is contemplating completing an engineering degree.

One is a director of a nonprofit.

One works at an enterprise help desk (Starbucks, Seattle) and made a point of saying that although his current employment is not directly related to math, that multiple potential employers found his math degree to be a desirable credential.

In summary, 6 of 9 contacted students are in math related fields and 9 of 9 describe themselves as employed or actively in graduate school.

### **Transcript Review**

Transcripts are reviewed each assessment cycle to determine if students graduate in a timely fashion and as an opportunity to holistically observe the degree path.

Eight transcripts were analyzed, consisting of all students who graduated or applied to graduate during the period from Summer 2013 through Spring 2016 as provided by the Registrar. Of these, all students completed a degree in a timely fashion. Five students obtained a degree in four years, and one transfer student completed his last year of

study at UAF. One student took five years but completed a secondary education certificate at the same time. The final student completed a degree in four years after an isolated initial year in 2008.

In all cases, the course ordering and progression towards the degree seemed reasonable.

Five of the eight students either took math or statistics graduate classes as part of their undergraduate curriculum, or went on to enroll in a math or statistics graduate program at UAF.

We looked at the elective classes students chose to take and noted that some of the courses with smaller adherence (topology and number theory) were also courses that were explicitly listed in the exit surveys as topics students wished they had access to. This discrepancy is discussed below.

Statistics-option undergraduate students are required to take one of Real Analysis or Abstract Algebra for their degree, with Real Analysis being preferable. However, all statistic option students took Abstract Algebra, not Real Analysis.

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

Very strong ETS test scores indicate that students who complete an undergraduate major in mathematics at UAF successfully learn the core of baccalaureate mathematics to an extent that meets or exceeds national standards.

Students are reporting a high level of satisfaction with their training and experience at UAF. Advising stands out as a potential weak point, however. Some students remarked that they wished that they had stronger advising, and some students reported that they wished they had access to classes that were, in fact, accessible to them.

The graduates we were able to contact are generally obtaining work or obtaining follow-up training in fields associated with their undergraduate education.

There is substantial interaction between the undergraduate and graduate programs.

Statistics students are not taking Real Analysis to the extent that is desirable.

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

We note two areas for potential curricular changes that can address the conclusions above.

- A) Students report some weakness in advising. We observe that although students have individual advisors, there is not a collective or cohesive advising

experience. We propose to have an evening, once a semester, for majors to meet each other, discuss upcoming classes, and obtain degree advice.

- B) Statistics faculty may wish to modify the statistics option to encourage more students to take Real Analysis. One approach would be to allow Abstract Algebra as an option only with explicit advisor approval.

Both of these topics will be brought to the attention of the department as a whole for discussion.

Additionally, we observe that there is room for improvement in our data collection and maintenance. Responsibility for data gathering each year is largely the responsibility of the professor teaching our Senior Seminar, but also the individual teaching the Statistics Consulting Seminar. This role changes from year to year; there is not a single champion and tasks can be overlooked or forgotten. We propose that a single faculty member be assigned every year (not just in years when reports are due) the task of coordinating with the relevant professors to ensure consistent data gathering.

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

The conclusions and proposals are due to David Maxwell, Jill Faudree, and John Rhodes. Implementation of these proposed changes will require departmental consultation and approval.