

Annual Report for Academic Year 2008-2009

Department of Mathematics and Statistics Student Learning Outcomes Assessment for BS and BA Degrees in Mathematics

INTENDED OUTCOMES OBJECTIVES	ASSESSMENT CRITERIA	IMPLEMENTATION PROCEDURES (what, when, who)
1) Our curriculum will be comparable to national standards.	Compare our program to University of Washington, University of Wyoming, and University of North Dakota.	The math assessment committee will compare the curriculum at UAF to that of the three specified institutions (all state research universities) every three years and will include their findings and recommendations in the annual assessment report.

Report: The math assessment committee compared curricula against the specified institutions this year, having last undertaken this process in 2005-2006. The findings are included here.

University of Wyoming (UWy)

The University of Wyoming offers a single undergraduate mathematics degree program requiring 48 semester credits, which is closely matched by our programs requiring 45 semester credits.

The required core consists of a calculus sequence, linear algebra, programming, and a "Math Majors Seminar". The "Math Majors Seminar" comes in two flavors, either an overview of classical problems, modern ideas and people in mathematics, or as a preparation course for the Putnam competition. These are interesting recruiting classes and have no equivalent at UAF. Beyond these requirements, all remaining classes are electives. There is a proofs class (coming in two flavors with an emphasis on either set theory or polynomials) that corresponds with our required proofs class. There is an algebra course that corresponds with our required algebra class, as well as a two semester analysis sequence that matches roughly with our required one semester analysis class. Among the electives, there is substantial overlap, with UAF offering more choice and more advanced courses. UAF offers topology, applied analysis, differential geometry, discrete math, and combinatorics, all of which have no equivalent at UWy. In addition, UWy has no capstone course similar to our Senior Seminar (F490).

Despite the lack of options at the upper division level, UWy has made creative and potentially interesting choices for beginning math majors, including a topics-based proofs class and a recruitment class. These are ideas that the undergraduate committee should investigate next year.

University of North Dakota (UND)

The University of North Dakota (UND) has a single mathematics degree program requiring 38 semester credits. The degree requires a calculus sequence, linear algebra, ODEs, and 24 elective credits including two year long sequences, at least one of which at the 400 level. Interestingly, UND has a proofs class (based on set theory) but it is not a requirement, and is only a suggested prerequisite for upper division courses. UND offers linear algebra in two varieties, one general class and one for math majors (forming part of a year-long algebra sequence). The set of available year-long sequences shows attention to the AMS recommendation that programs offer sequences of courses (although the sequence consisting of "take two of topology, complex, and number theory" shows excessive conformation to this idea).

The selection of electives at the two schools is comparable with some areas not overlapping (UAF offers differential geometry and non-Euclidean geometry; UND offers linear algebra for math majors, cryptological mathematics, numerical analysis II, and topics in operations research). The UAF curriculum is more rigorous, requiring more credit hours and insisting that an undergraduate learn both analysis and algebra at the upper division level. The UND offering of a linear algebra class for math majors is a positive aspect of their curriculum, and is one that is being discussed by the UAF undergraduate committee.

University of Washington (UW)

The University of Washington offers five undergraduate mathematics degrees: two BSc degrees and three BA degrees (including one with a teaching emphasis). Of these the "Standard" (as opposed to "Comprehensive") BSc program is most comparable with our own. The Standard option requires 66 quarter credits of math classes, which corresponds well with our 45 semester credits.

The mandatory part of the UW program is very similar to our own, with overlap including a calculus sequence, proofs, linear algebra, and a two-quarter analysis sequence that corresponds with our one-semester analysis class. UAF requires abstract algebra whereas UW allows this as an option. UAF also has a capstone course with no equivalent at UW. Conversely, UW requires an advanced analysis course covering sophisticated topics such as the implicit function theorem that has no equivalent at UAF.

In addition to the above, UW requires 33 quarter credits of electives broken into two categories: an "Advanced Mathematics Core" (21 quarter credits = 14 semester credits) and "Electives" (12 quarter credits = 8 semester credits). The Advanced Mathematics Core generally consists of sequences: e.g. a three course sequence (= one year) of abstract algebra, and students are required to complete 7 quarters including at least two two-quarter sequences. At this level, the UW curriculum exceeds the UAF curriculum in both breadth and depth. UW offers a year of abstract algebra, whereas we have a semester. UW offers a year of 400-level analysis beyond our highest level of undergraduate analysis. There is a year-long sequence in optimization, another in probability, and another in numerical analysis. In addition there are two-course sequences in combinatorics, dynamical systems, and stochastic processes. For these electives, UAF offers at most a semester class, and in some cases, no class at all.

2) Our students will master a core of mathematical concepts comparable with that of other institutions.	All majors will be required to take the ETS Major Fields Test in Mathematics.	Every spring, the instructor of Math 490, a required course for all math majors, will require all students to take the Major Fields Test in Mathematics. The results will be summarized by the assessment committee in the annual report the following spring.
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Status: During MATH 490 in the spring semester nine took the Math Fields Test in Mathematics. On a scale of 120 – 200, these students earned scores of 200, 193, 190, 172, 169, 161, 158, 158, 140. Of the nine students, one responded to fewer than 50% of the questions. By looking online on the ETS website, it is possible to find comparative information for UAF student scores versus scores of all students taking the test. This comparative data from ETS is from years 2004-2008. A copy of the comparison table is attached. Our student scores were in the 95% (1), 90% (2), 80% (1), 75% (1), 60% (1), 55% (2), and 40% (1). As five out of nine students scored at or above the 75th percentile, this is confirmation that our program is successful and operating at or above national standards.

The table below summarizes the mean percent correct by topic.

Topic	Mean Percent Correct
Calculus	48
Algebra	53
Routine	57
Nonroutine	38
Applied	45

3) Our students will have the opportunity to develop the necessary skills to achieve their career goals in mathematics.	A) Exit survey B) Alumni survey	A) Every spring, the instructor of Math 490, a required course for all math majors, will give all students an exit survey at the end of the course. The results will be summarized by the assessment committee in the annual report the following spring. B) Every May, alumni surveys will be sent to all students who graduated with a degree in mathematics two years prior. The returned surveys will be summarized by the assessment committee in the annual report the following spring.
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Status:

The exit survey was handed out during the final exam in MATH 490, and two students returned the survey thus far. These two students were pleased with the Mathematics major and reported quite different post-degree goals. One intends to become certified to be a high school mathematics teacher and the other to attend graduate school. That both these students found the major stimulating indicates our program is working to fulfill the diverse needs of our student body.

Subjective comments from the students included a strong interest that more electives be added to the major, encouragement to toughen up the requirements of our senior seminar which seemed too easy, and a reflection

that the teaching at UAF was uniformly much better than at a state school in CA (one of the majors transferred to UAF).

Faculty in the Department are aware that we fail to offer current electives listed in the catalog often enough, and that the curriculum in general is thin. With the hiring of two new faculty members who will begin in fall 2009, this should improve. In particular, the undergraduate committee ushered three new courses through the Faculty Senate committee at the undergraduate level: Topics in Combinatorics, Number Theory, Topics in Mathematics. This will be a significant enhancement to our current curriculum. The content in the Topics in Mathematics course will be chosen by the instructor, so this gives much flexibility to possible course offerings.

The new faculty members will also make possible the offering of a new section of Differential Equations in the fall. As the department's service courses often have a large enrollment, this will help alleviate some stress on the teaching needs at UAF.

The overall assessment is that the Department is training its majors well. There are no budget implications of this review other than that our lower level service courses are still on the large side.

4) Students will gain a broad background in liberal arts, fine arts, science, and ethics.	University core requirement fulfilled	Checked automatically by graduation office. These classes are separately assessed at the University level.
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Status: Graduates are necessarily fulfilling the core requirements and therefore gain exposure to a diverse collection of academic pursuits.

5) We will monitor the effectiveness and implementation of our program requirements.	Transcript check of recent graduates	Every Spring the chair of the department will review the transcripts of students graduating with degrees in Mathematics and communicate any problems or surprises to the assessment committee.
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Status: After examining the transcripts of recent graduates, the chair of the department, John Rhodes, reports that there are no problems or surprises. Overall, student grades in mathematics seem to be in line with other UAF departments.