Department of Mathematics and Statistics
Assessment Report
for the
Bachelors Degree in Mathematics
2005-2006

Introduction

The Department of Mathematics and Statistics (DMS) has collected information as directed by the department's Student Learning Outcomes Assessment Plan. This includes a comparison to other institutions, the Major Fields Test in Mathematics, surveys of graduating seniors, and the chair's review of transcripts. We have included some additional material such as basic statistics on our student body and student participation in international contests. The report concludes with a list of suggested actions for the department to pursue in the coming academic year.

Assessment Facts and Analysis

I. Comparison to Other Institutions

We examined the undergraduate mathematics course offerings at the University of Wyoming, the University of North Dakota, and the University of Washington. We found the programs at the University of Wyoming and the University of North Dakota to be very similar to that at UAF. The program at the University of Washington is clearly stronger.

University of Wyoming. The University of Wyoming offers an undergraduate course in partial differential equations that looks stronger than what we offer in Math 421. They also have a course aimed at preparation for the Putnam exam, which we do only informally and sporadically. On the other hand, they seem to offer no topology or differential geometry, whereas we do, at least on an as-demand-warrants basis. Overall their offerings appear comparable to ours.

University of North Dakota. The UND program also appears comparable to ours. Notable differences: They offer a course in set theory and logic that looks more demanding than what we offer in Math 215. They also offer a cooperative education course. They do not seem to offer any differential geometry.

The University of Washington. The UW program is clearly stronger than ours. Because of their numbers, they are obviously able to offer a wider variety of courses than we can. Examples of courses offered at UW but not at UAF:

> Several separate honors courses, offered at various levels.
> Computer lab for mathematics, offered at various levels.
> Optimization.
> Dynamical systems.
> Math enrichment for the schools. (More than what we do in Math 205-206.)

Mathematical communication.

Moreover, UW has a separate department for applied mathematics, which offers courses in fluid dynamics, mathematical biology, and much more.

II. Summary of Major Fields Test in Mathematics

The Major Fields Test is given each spring in Math 490, Senior Seminar. This is a required course for all math majors. Despite the name, not all students in the course are necessarily seniors. However, all students must have passed at least one Math 401 Advanced Calculus or Math 308 Abstract Algebra. Thus, all students have completed the majority of the core math courses and at least one of the two most advanced courses. The exam is usually given near the end of the semester, thus the scores from this year (2006-2007) will not be received and summarized until next year.

As the chart below indicates, our students have consistently scored well. The scores from last year (2005-2006) are very high placing the department in the 95th percentile among about 200 North American colleges offering this test in math. It should be noted that the universities and colleges taking the exam are not, in general, the very best in the nation, but there are many like institutions in the group.

ETS Major Field Test in Mathematics Institutional Mean Score								
Year	1999	2000	2001	2002	2003	2004	2005	2006
Number of Students (^transfers)	6 (2)	13 (5)	10 (7)	6 (3)	12 (5)	7 (1)	14 (5)	15 (3)
Calculus mean % correct	56.7	50.3	40	45.5	51.6	56.0	38.1	44.9
(*percentile)	86%	74%	81%	92%	97%	99%	68%	90%
Algebra mean % correct	65.5	49.2	48.2	54.5	59.6	71.4	40.9	47.5
(*percentile)	93%	47%	65%	88%	94%	99%	67%	86%
Routine mean % correct	69.2	57.6	55.7	65.5	66.5	74.9	42.7	48.3
(*percentile)	NA	NA	86%	97%	99%	99%	77%	90%
Non routine mean % correct	47.8	31.2	26.1	30.0	36.2	44.9	28.0	32.7
(*percentile)	NA	NA	57%	82%	97%	98%	55%	88%
Applied mean % correct	46.3	47.0	47.7	52.0	60.3	63.7	42.1	46.7
(*percentile)	NA	NA	84%	92%	99%	99%	85%	93%
Overall score	174.7	162.2	161.0	170.3	175.2	185.6	160.1	179.5
(*percentile)	**97%**	**84%**	**86%**	**95%**	**99%**	**99%**	**75%**	**95%**

^ number of students transferring from other institutions
* Percentile among other institutions giving the Major Field Test

We also have the following information about the students taking the exam.

Gender Distribution Major Field Test participants								
Year	1999	2000	2001	2002	2003	2004	2005	2006
Males	4	8	6	3	6	5	7	11
Females	2	5	4	3	5	2	7	4
No response	0	0	0	0	1	0	0	0

Ethnicity Distribution Major Field Test Participants								
Year	1999	2000	2001	2002	2003	2004	2005	2006
American Indian			1				1	
Asian/Pacific Am.					1	1	1	
Black/African Am.		1						
Mexican Am.								
Puerto Rican								
Other Hispanic								1
White	4	10	7	6	8	6	12	13
Other	2	2			1			1
No Response			2		2			

III. Exit and Alumni Surveys

An exit survey is given each spring to all students in Math 490 Senior Seminar. The data for the review period is missing but for the sake of completeness we present here the data collected from the 14 students in Math 490 Senior Seminar in Spring 2005 at the end of the Spring 2005 semester. This was the first year this particular survey was used.

Expected Graduation Date		
Spring 2005	Summer 2005	Fall 2005
7	2	5

Plans after Graduation	
graduate school	8
work in math related field	5
work in non-math related field	0
Other	0
Unsure	4

Note, some students checked both graduate school and work in a math related field. Our graduates are ambitious -- over the past eight years, 58% of our graduates have indicated they plan to attend graduate school. And though we have only just begun to track our graduates (and thus our sample size is small), our initial results are positive. Of

those surveyed one in three is in graduate school in math or a math related field and 78% are employed in a math related field.

Responses to the statement:
I'm confident the UAF Math program adequately prepared me in _____ .

	Strongly agree	agree	neutral	disagree	strongly disagree	not applicable	total
Calculus	7	3	2	0	0	2	14
Proofs	5	7	0	0	0	2	14
Abstract Algebra	5	6	1	1	0	1	14
Linear Algebra	2	6	4	0	0	2	14
Advanced Calculus	2	5	2	0	1	4	14

Responses to the statement:
I'm satisfied with (each item) in the UAF Math program.

	strongly agree	agree	Neutral	disagree	strongly disagree	not applicable	total
Advising	4	5	3	1	0	1	14
Availability of math elective courses	1	6	1	5	1	0	14
Course scheduling	2	8	0	4	0	0	14

The results show that the students have a generally positive to very positive view of the degree program, the faculty, and the curriculum.

The alumni survey was not conducted during the past two years. The department should discuss whether to eliminate this survey as part of the assessment process.

IV. Transcript Review

The Department Chair reviews the transcript of each student graduating each semester as part of the graduation review process. Although the primary purpose of this review is to certify students for graduation, the Chair notes unusual course sequencing, repeated courses, and other features of student programs. This year the Chair reviewed the transcripts of the 5 math majors graduating in May 2007 and the 7 graduating students receiving minors in mathematics. Several required courses had to be repeated because of withdrawals or for improved grades by the five graduating majors; 3 had to repeat Advanced Calculus, MATH 401, and Linear Algebra, MATH 314, and 1 had to repeat Abstract Algebra, MATH 307. A TA has been assigned to work with students outside of class in Advanced Calculus and Abstract Algebra during the last two years to improve

success rates of our students in these classes. We will have to continue to assess the effectiveness of this effort.

Students graduating with a minor in mathematics earned degrees in a much wider collection of majors than previously noted; Petroleum engineering, psychology, Russian studies, electrical engineering, computer science, interdisciplinary, and journalism. Typically, we a majority of those earning minors are from engineering and computer science so this year's mix of students is a surprise.

Among the 5 majors and 7 minor student transcript's reviewed the chair noted only one course taken out of prerequisite sequence; a student taking MATH 201 and 202 concurrently after receiving a D in MATH 201 the previous semester. This student was successful in completing both courses.

V. List of Graduates

The following are the students who graduated during the past academic year (05-06).

James Becwar
Robin Chapman (cum laude)
Sunit Das
Michael Hazzlet
Dianna Heimerl (cum laude)
Jimie Horath
Todd Hughes
Dennis Jackson
Amanda Nebert (cum laude)
Rayna Walker
Jessica Weed
Elyse Yeager (cum laude)

Note, that one third of our BS students graduated cum laude.

VI. Student Activities

The department had two teams compete in the Mathematical Contest in Modeling (MCM) in spring 2006. The MCM is an international competition and 748 teams from all over the world participated that year. One of our teams, Paul Gentemann, Alex Ross, and Kent Overstreet, chose Problem A (irrigation system design) and the other one, Troy Lawlor, Jay Schamel, and Elyse Yeager, did Problem B (airport wheel chair access design). Project A is "Positioning and Moving Sprinkler System for Irrigation" and Project B is "Graph Traversal Simulation Model." Both projects received a rating of Meritorious Mention. This rating was given to only 16% of the teams and should be considered as a great achievement. Visit http://www.cs.uaf.edu/2006/mcm/ for more information.

Suggested Actions

Below is a list of issues raised by the assessment process or other activities that we suggest the department address fall semester.

- Based on the Chair's analysis of transcripts, the department should be more vigilant about enforcing prerequisites.
- The Department should continue to provide a TA to meet with Advanced Calculus and Abstract Algebra students outside of class to help improve student learning success in these courses. Continued assessment of student success in these courses is needed.
- The alumni survey was not conducted during the past two years. The Department should discuss whether to eliminate this survey as part of the assessment process.
- The Department should review the suggestions made by the Dean and the Provost during the Program Review process and revise outcomes assessment processes as appropriate.

Summary

The quantitative scores of our students on both the Fields Test and the Exit Survey are quite positive. The department has made changes to improve this process. Further evidence that our students have a solid knowledge of mathematics is their success in a major international contest. One third of our BS students graduated cum laude.

Alexei Rybkin
David Maxwell
Jill Faudree
Dana Thomas

23 February 2010

Appendix

Department of Mathematics and Statistics
Student Learning Outcomes Assessment Plan
for the
Bachelor of Science and Bachelor of Arts in Mathematics

Date: February 2004

Certificate or Degree Program: Bachelor of Science and Bachelor of Arts in Mathematics

Mission: We shall provide quality education responsive to the needs of individual students and the diverse population of Alaska.

Goal: To assure that our graduates are adequately prepared to succeed in the job market in mathematics or a closely related field.

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.
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.
3) Our students will have the opportunity to develop the skills necessary 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.
4) Students will gain a broad background in liberal arts, fine arts, science, and ethics.	A) university core requirement fulfilled	A) Checked automatically by graduation office. These classes are separately assessed at the University level.
5) We will monitor the effectiveness and implementation of our program requirements.	A) transcript check of recent graduates	A) 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.

Department of Mathematical Sciences

In an effort to follow the careers of our students we request you complete this form. Information on individuals will not be distributed outside the university.

Name: _____   Date:

_____

Permanent Email address: _____

Permanent Mailing address: _____

_____

_____

_____

Department of Mathematical Sciences

Outcomes Assessment Survey – the purpose of this survey is to collect student information useful for improving our curriculum and the future plans of our students. Your name is not requested on this form so your responses are anonymous. Only summaries of responses will be reported and used for curricular improvement and for institutional accreditation purposes.

Current date: _____

Expected graduation date: _____

After graduating are you

☐ Planning on attending graduate school

☐ Planning on working in a math-related field

☐ Planning on working in a non-math related field

☐ Other, please describe

_____

☐ Unsure

If you already have a job, job offer, or graduate school acceptance, please tell us where:

What topics in your degree program were the most beneficial?

What topics in your degree program were the least beneficial?

What additional topics do you wish you had the opportunity to learn while in the UAF Math program?

For each of the following fields, please indicate your response to the statement "I'm confident the UAF Math program adequately prepared me in _____."

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Not Applicable
Calculus	☐	☐	☐	☐	☐	☐
Proofs	☐	☐	☐	☐	☐	☐
Abstract Algebra	☐	☐	☐	☐	☐	☐
Linear Algebra	☐	☐	☐	☐	☐	☐
Advanced Calculus	☐	☐	☐	☐	☐	☐

If you marked "Disagree" or "Strongly Disagree" in any of the above categories, please give details:

For each of the following fields, please indicate your response to the statement "I am satisfied with (each item) in the UAF Math program.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Not Applicable
Advising	☐	☐	☐	☐	☐	☐
Availability of math elective courses	☐	☐	☐	☐	☐	☐
Course Scheduling	☐	☐	☐	☐	☐	☐

If you marked "Disagree" or "Strongly Disagree" in any of the above categories, please give details: