Mathematics Program

School of Arts & Science, University of Alaska Southeast

2014-15 Annual Report on Assessment of Program Learning Outcomes

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Goals/Objectives: The goals/objectives and methods of assessment for the Mathematics program in general, and the major and minor specifically are detailed in the revised (May 8, 2013) *Mathematics Program Assessment Plan*, posted on the Provost's website.

Data Collection and Analysis: Institutional data was unavailable for this annual report.

Findings for this report are based on observations made in the Mathematics Junior/Senior Seminar or other relevant courses, on observed course enrollment figures in QADHOC, and by way of *ongoing yearlong discussions* among and feedback from program faculty at the three campuses.

Assessing the BS in Mathematics and Minors:

A few program actions mentioned in the 2013-2014 report are ongoing.

Enrollment Data:

- In AY 2015, Banner gives 18 mathematics majors. Each of these majors is categorized as Active New or Active Continuing, Grad 14, Grad 15, or COM (change of major) or Left UAS; see definitions below. Many of the math majors listed in Banner have met with the math program coordinator, but some have not. In these meetings, the program coordinator assigns the student to a math faculty advisor, which generally seems to be an indicator of success for completing the degree.
- The current status of mathematics majors is shown below. Note that many students listed as "*Left UAS or Unknown Status*" in the last Annual Report have been removed from this updated table.

	Total 2014	Total 2015	Active New	Active Continuing	Grad 14	COM or Left UAS	Grad 15
# of Majors	19	18	3	15	4	1	3

Note that the total number of majors in AY 2014 can be obtained by summing students with a status of "Active Continuing", "Grad 14", and "COM or Left UAS". The total number of majors in AY 2015 can be obtained by summing "Active New" and "Active Continuing" students. The "Grad 15" category is a subset of the total number of majors in 2015.

For the purposes of this table, the following definitions were used to indicate the status of a student who has declared a math major:
Active status indicates a major who was enrolled in at least one course at UAS (not necessarily a math course) during AY 2015.
Active new status indicates those active students who were either not enrolled in any course at UAS in AY 2014 or were not declared as a math major in AY 2014, but were listed as a math major and were enrolled in at least one course at UAS in AY 2015.
Active continuing status indicates those active students who are not "new".
Grad 15 status indicates majors that graduated in Fall 2014 or Spring 2015. These graduates also have "active continuing" status.

Grad 14 status indicates majors that graduated in Fall 2013 or Spring 2014.
COM or Left UAS status indicates majors that were "active" in AY 2014, but were not active in AY 2015 and did not graduate in AY 2014. Subcategories of this status include math majors that 1) changed their major, 2) transferred to another MAU (UAA or UAF), or 3) transferred to a non-UA institution or are no longer pursing a degree at any institution, for whatever reason.

Notes: An "active" major includes those students who are no longer pursuing a math degree, but have not changed their major. "New" students may have declared a math major previously, but delayed graduation or left UAS on a student exchange for AY 2014, so they are not technically new to the math program.

Achievements of Majors:

In addition to the Capstone Course, math faculty work continuously to provide our majors with opportunities that demonstrate their knowledge in the subject and showcase their achievements. Additional opportunities arise throughout the year that allow majors to explore their unique areas of mathematical interest. Some of these achievements are given below:

- The cumulative GPA of junior and senior majors in AY 2014-15 was 3.54.
- Three UAS students were nominated and accepted into the Pi Mu Epsilon Alaska Alpha Chapter during the summer of 2015: Michael Bushey, Ashlynn Kay, and Ben Malander.
- Three mathematics majors presented their senior capstone projects at the UAS Art Meets Science Symposium on April 15, 2015: "Developing a New Class of Functions" by Jo Anne Baranski, "The Laplace Transform: Differential Equations with Complex Valued Solutions" by Andre Bunton, and "Dynamical Systems" by John Heritscko.
- Andre Bunton received the Ron Seater award in Fall 2014 and was also our Outstanding Graduate for AY 2014-15.
- In December, 2014, Andre Bunton and Ben Malander took the annual William Lowell Putnam Mathematics Competition (the Putnam Competition). Andre became the first math major at UAS to earn a positive score. The Putnam Competition is an incredibly difficult 8-hour exam open to all undergraduate students in the country. A positive score is quite rare given that the median score is often zero or one (out of 120) despite being attempted by students specializing in mathematics.
- Mathematics major, Niki Jacobs, graduated in May 2014 and is currently attending graduate school at UAF, pursuing a doctorate degree in atmospheric chemistry. She has obtained a research grant from NASA to analyze methane emissions measured at Poker Flat Research Range, Alaska.
- Mathematics major, Stephen Ellison, graduated in May 2011 and was accepted at the University of Washington School of Medicine MD program in Spring 2015. He began classes in Fall 2015.

The accomplishments of our majors and their post-graduate pursuits indicate the mathematics program is a valuable degree and producing the desired results. Through the program, mathematics majors are provided valuable experiences and a competitive edge when applying for employment or admission to graduate programs.

Assessment of GERs and Developmental Courses

Enrollments:

- Enrollment figures for the MATH 106 (now MATH 113): *Concepts and Contemporary Applications of Mathematics* (after the withdrawal date) are given in the table below. The course was reinstituted in Fall 2012 as an additional GER option for some majors. So far, the course seems to be a good option for some students. As an experiment, MATH 106 will only be offered via distance by Sitka or Ketchikan beginning Spring 2015. Enrollments for this course do not appear to be influenced by the delivery method available.

MATH 106 **Now MATH 113**	Fall 2012	Spring 2013	Fall 2013	Spring 2014	Fall 2014	Spring 2015
Juneau	5	11	14	6	7	--
Ketchikan	--	--	4	--	6	--
Sitka	--	7	--	9	--	11

- STAT 107: *Survey of Statistics* has been offered exclusively via distance delivery as of Spring 2013 through the Sitka campus. The rationale for this change was to increase average enrollments; the local Juneau campus course typically had very low enrollments for a lower-division course. Enrollments after the withdrawal date since Spring 2013 are given in the table below. While it appears that this structure continues to meet the needs of these students through Fall 2014, the cause for lower enrollment in Spring 2015 is unclear.

STAT 107	Spring 2013	Fall 2013	Spring 2014	Fall 2014	Spring 2015
Sitka	17	12	15	14	6

- Enrollments for lower-level mathematics and statistics courses after the withdrawal dates in Summer 2013, Summer 14, and Summer 2015 are given in the table below.

		MATH 054	**MATH 055**	**MATH 105**	**MATH 107** ***Now MATH 151***	**MATH 108** ***Now MATH 152***	**STAT 107**	**STAT 273**
Summer 13 Average	**J**	--	--	11	--	--	--	--
	K	--	--	--	--	--	--	--
	T	8	13	28	16	--	7	30
Summer 14 Average	**J**	--	--	6	--	4	--	--
	K	--	--	--	--	--	--	--
	T	3	17	33	20	--	7	25
Summer 15 Average	**J**	--	--	--	--	--	--	--
	K	--	--	--	--	--	--	--
	T	3	24	37	24	--	7	18

Summer offerings seem to be adequate with higher enrollments in MATH 105 and STAT 273, noting that some sections have been canceled for low enrollment.

- Average enrollments per section after the withdraw date for other lower-level MATH/STAT courses for the Fall 2013 and Spring 2014 semesters at the three campuses are given below. Sitka enrollment figures do not include courses taught at the Petersburg and Wrangell high schools.

		MATH 054	MATH 055	MATH 105	MATH 106	MATH 107	MATH 108	STAT 107	STAT 273
Fall 14 Average	J	28	21	24	7	19	20	--	19
	K	14	13	12	6	--	--	--	15
	T	12	22	36	--	15	5	14	--
Spring 15 Average	J	17	15	22	--	26	20	--	12
	K	7	13	21	--	5	--	--	5
	T	15	33	9	11	15	--	6	27
AY Ave.	J	23	18	23	7	23	20	--	16
	K	11	13	19	6	5	--	--	11
	T	14	26	20	11	15	5	10	27
AY Totals / # sections	J	45 / 2	128 / 7	162 / 7	7 / 1	114 / 5	40 / 2	--	31 / 2
	K	21 / 2	26 / 2	76 / 4	6 / 1	5 / 1	--	--	34 / 3
	T	27 / 2	77 / 3	80 / 4	11 / 1	104 / 7	5 / 1	20 / 2	27 / 1

- Enrollments in MATH S205/206 during AY 2015 were 22 and 17, respectively. To date, no concerns about the courses have been received by the mathematics program. These courses continue to be taught by a School of Education faculty member.

Faculty and Resources

Workloads, Funding, and University Service:

- Workloads have been fairly consistent for our bipartite math faculty and term position making sure to offer sufficient developmental courses, GERs, and major courses. Chris Hay-Jahans often teaches an overload to cover STAT 400 or STAT 401. More specific data on faculty teaching was not made available by Institutional Research.
- Math faculty have adequate funding to attend approximately one professional meeting or conference each year. UAS math faculty continue to take advantage of this funding and contribute back to the mathematical community via presentations of original work, undergraduate course findings, and undergraduate research; judging student posters / presentations; organizing special sessions; and participating in workshops.
- Math faculty are very active in university service, holding positions in the mathematics program, faculty senate and faculty senate committees, statewide committees, as well as several subcommittees that form throughout the year.

Recruitment Efforts and Community Service:

In addition to recruitment that goes on via Instructor-Student relationships built in Developmental and GER courses, math faculty provide additional opportunities to build a positive environment around mathematics in Southeast Alaska and to encourage math-minded students to pursue a mathematics major or minor at UAS.

- Andrzej Piotrowski is the faculty sponsor for the Math Club in Juneau, which is open to all students interested in mathematics, whether or not they are majors. The activities include presentations by guest speakers, UAS mathematics faculty, and solving a wide variety of mathematics puzzles and problems. In October 2014, Brian Blitz gave a talk on the Mandelbrot Set. A Pi Day celebration was hosted by the Math Club at the Schiable House on March 3, 2014. Gatherings at Auke Rec were also organized for December 2014 and April 2015.

- Mathematics majors regularly tutor students enrolled in MATH 055 – MATH 200 (now MATH 251) in the Learning Center. Teaching mathematics is a great way to hone skills in the subject, the practice builds positive relationships, and it encourages students in these courses to work hard and succeed.
- The Juneau mathematics faculty continue to conduct the Annual JDHS/TMHS Calculus Camp on the Juneau campus in April. Many students in high school Calculus intend to earn college credit through the AP Calculus exam (AB for Calculus I and BC for Calculus II). This series of lectures and problem solving covers the major topics in Calculus and begins a relationship with talented high school students and UAS math faculty.
- Faculty reach out to local high school students and their mentors, judge student projects in the Southeast Alaska Regional Science Fair and First Lego League, present at the I'm Going to College event for local 5th graders, etc.

Consistency:

- Guidelines from the MAA (Mathematical Association of America) suggest consistency as a cornerstone of any quality mathematics program. As a program, we strive for consistency in courses with multiple sections by designating a course coordinator, collaborating on similar exams and classroom concerns throughout the semester, as well as giving common final exams. For MATH 107 (Now MATH 151), the final exam is written by a faculty member not teaching the course, to minimize bias from individual teaching style and problem selection. The final exam is then graded by all math faculty to ensure consistency for that semester and for each year. In addition, math faculty regularly meet and discuss teaching techniques, issues that come up in the classroom, course content, etc. both formally and informally.

Program Changes / Measures Based on Assessment Results:

- In April 2014, the Board of Regents passed a resolution to standardize lower level mathematics courses as well as placement exam policies across all three campuses. The intention of this request was to improve transferability within the UA system.

  Representatives from UAS (Brian Blitz and Megan Buzby), UAF, and UAA met at UAA in Fall 2014 to discuss aligning course titles, numbers, and descriptions for 100 and 200 level courses, as well as Student Learning Outcomes. Consensus was reached after continued e-mail communication and changes were implemented for AY 2015-16. See the last page in this document for a summary of title and number changes. See the UAS website for common course descriptions and Student Learning Outcomes.
- Student Learning Outcomes for all mathematics and statistics courses were completed by May 2015 – lower division courses (developmental, 100, 200) in Spring 2014 and upper division courses in Spring 2015.
- As a program, we decided to offer some online components for MATH 054 on the Juneau campus, including online homework. Class sizes were small, so statistical evidence is not meaningful. Anecdotal evidence suggests there is no major difference in the rates of completion for this structure as compared to face-to-face teaching of this course. Currently, this course is only offered via distance through Sitka and Ketchikan.
- As noted in previous reports, Jill Dumesnil (Associate Dean and Full Professor in the Math Program) has been teaching a two-week Math Refresher for New Students the last several years, just prior to the start of each fall semester. The Learning Center took the program over in Summer 2014, but did not offer it in Summer 2015. We will keep this in mind as we consider the progression of developmental and remedial mathematics at UAS.
- In an effort to ease the financial burden on our students, Andrzej Piotrowski used a free online textbook (approved by the American Institute of Mathematics) for MATH 302 in Spring 2015. Chris Hay-Jahans will be using this textbook in Spring 2017 as well.

Upcoming Program Changes / Measures Based on Assessment Results:

The program's educational philosophy and guidelines for remedial, developmental and GER courses are discussed regularly during the academic year. A few of the changes currently being considered as a result of those discussions are given below.

- UAS and UAA both utilize the Accuplacer Math Placement exam while UAF is in the second of a three-year test to determine if a computer-based placement program (ALEKS) is a viable alternative. The UAS Learning Center is considering using ALEKS as a study tool for students taking the Accuplacer exam until results are available from UAF's study.
    - Tentative results from UAF indicate a higher placement rate at the lower level courses (only 6% placing into remedial math as opposed to 17 – 20% placed there historically) as well as increased placement into Calculus.
    - Faculty were hoping for increased pass rates at the level of placement using ALEKS, but they are statistically no different than with the Accuplacer test. There is also no data yet on graduation rates for those students to determine temporary success vs. full success.
- In an effort to increase the number of mathematics majors, we are considering a "repackaging" of the BS degree in mathematics. In particular, we are considering several "tracks" students may take which appeal to different interests: traditional, secondary education, and interdisciplinary.
- Faculty are also experimenting with different styles of teaching in the classroom, including a version of "flipped" classrooms which is more student-driven and a "one-room schoolhouse", which is also somewhat "flipped" but allows for more than one course to be taught at the same time in the same room.

Summary of Results

The BS in mathematics continues to produce quality majors prepared for employment and graduate school. Mathematics faculty continue to offer sufficient developmental and GER courses, supporting all majors at UAS and recruiting students into the major. Class sizes remain small with a high faculty to student ratio.

An area for improvement is in the numbers of mathematics majors and minors. The math faculty continue to work hard to increase our enrollments and provide creative solutions while maintaining the integrity of our courses and the bachelor's degree.

Old Course Numbers and Names		New Course Numbers and Names (as of Fall 2015)	
MATH S054	Preparatory Mathematics	**MATH S054**	Prealgebra
MATH S055	Fundamentals of Algebra	**MATH S055**	Elementary Algebra
MATH S105	Intermediate Algebra	**MATH S105**	Intermediate Algebra
MATH S106	Concepts and Contemporary Applications of Mathematics	**MATH S113**	Concepts and Contemporary Applications of Mathematics
MATH S107	College Algebra	**MATH S151**	College Algebra for Calculus
MATH S108	Trigonometry	**MATH S152**	Trigonometry
MATH S200	Calculus I	**MATH S251**	Calculus I
MATH S201	Calculus II	**MATH S252**	Calculus II
MATH S202	Calculus III	**MATH S253**	Calculus III
MATH S205	Mathematics for Elementary School Teachers I	**MATH S211**	Mathematics for Elementary School Teachers I
MATH S206	Mathematics for Elementary School Teachers II	**MATH S212**	Mathematics for Elementary School Teachers II
MATH S215	Introduction to Proofs	**MATH S265**	Introduction to Mathematical Proofs