

Mathematics Program

School of Arts & Science, University of Alaska Southeast

2019-20 Annual Report on Assessment of Program Learning Outcomes

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Format: This report adheres to the “Preferred Format” posted 3/1/2018 on the Provost’s website which aligns with Sections 4.1 and 4.2 of the posted Mathematics Assessment Plan.

1. Program Overview

The Bachelor of Science in Mathematics provides a solid foundation in mathematics. In addition to taking the core and interdisciplinary courses, students also take part in a seminar dedicated to undergraduate research during their last two years.

After obtaining the degree, students have opportunities in secondary education, graduate studies and direct entry into the job market. Each student is advised by faculty to achieve a specific program tailored for the student’s goals.

UAS is an institutional member of the Intercollegiate Biomathematics Alliance (IBA), a consortium of U. S. universities that promotes and fosters research and education in biomathematics. This membership opens doors to many opportunities and resources for both students and faculty at UAS.

In addition, UAS has the only Alaska chapter of Pi Mu Epsilon, a national honor society dedicated to the promotion of mathematics and recognition of students who successfully pursue mathematical understanding. The Alaska Alpha Chapter of Pi Mu Epsilon was installed in April of 2014 at UAS.

2. Program Learning Outcomes (PLOs)

The following program learning outcomes have been identified by the Mathematics Program faculty as being relevant to measuring the potential success of UAS mathematics Bachelor of Science graduates in the workforce or in academics.

Outcome 1: Competency in Core Subject Content

1A. Graduates will demonstrate skills in basic quantitative and analytic problem solving and competency in basic undergraduate mathematics coursework.

1B. Graduates will demonstrate knowledge of foundational theoretical concepts essential to the study of mathematics.

1C. Graduates will demonstrate an ability to extend and generalize foundational concepts and critically analyze and solve abstract problems in mathematics.

Outcome 2: Skills in Analysis, Application, and Technology Utilization

2A. Graduates will demonstrate the ability to use technology as an aid to understanding and solving mathematical problems.

2B. Graduates will demonstrate the ability to apply mathematical knowledge in new settings and situations.

2C. Graduates will demonstrate the ability to critically analyze and solve a wide variety of problems using theoretical or technological tools.

Outcome 3: Communication Skills

- 3A.** Graduates will demonstrate the ability to read and comprehend mathematical ideas.
- 3B.** Graduates will demonstrate the ability to communicate mathematical ideas in writing.
- 3C.** Graduates will demonstrate the ability to communicate mathematical ideas verbally.

Outcome 4: Professionalism and Independence

- 4A.** Graduates will produce a resume highlighting marketable mathematical skills and knowledge.
- 4B.** Graduates will demonstrate confidence in communicating mathematical ideas verbally and in writing.
- 4C.** Graduates will demonstrate the ability to independently pursue investigations in the mathematical sciences.

3. Data Collection Method(s)

We assessed each of our graduates on these outcomes by considering the Student Individual Record file (SIR file) for each. The contents of the SIR file are outlined below:

1. Resume
2. Degree audit
3. Final transcript
4. Final capstone seminar paper
5. Summary scorecard for the final capstone presentation
6. First seminar paper and presentation scorecard
7. Exit Survey
8. Proficiency matrix for PLO competency
9. Permanent contact information
10. Post-graduate surveys, if applicable

The permanent Juneau faculty members meet each spring (in early May) to review and evaluate the SIR file for each graduating mathematics major. There are three categories of assessment possible with a high and low in each category. The lowest category is “Does Not Meet Expectations” with a possible numerical score of 1 or 2. The second category is “Meets Expectations” with possible scores of 3 or 4. The last category is “Exceeds Expectations” with possible scores of 5 or 6.

4. Data from 2019-2020 Academic Year

The average score for the AY 20 graduates on each outcome is given in the table below along with the cumulative average score from AY 17 when the program began this assessment scheme.

Outcome	AY 20 Average Score	Cumulative Average Score
1A	6	4.8000
1B	6	4.2667
1C	6	3.7333
2A	6	4.1333
2B	6	3.8000
2C	6	3.8000
3A	6	4.4000
3B	6	3.8667

3C	6	3.9333
4A	5.5	2.7333
4B	5.5	4.2000
4C	6	4.2000

5. Evaluation of Data

On average, our students are meeting program expectations with the exception of outcome 4A, graduates will produce a resume highlighting marketable mathematical skills and knowledge. Consequently, we have added more instruction on resume writing and job searches to our Junior/Senior Seminar course.

We are now giving more direct instruction with example resumes and explicit examples to illustrate how to incorporate transferable, but non-cognitive, skills from coursework. We've also added the course requirement that each student turn in a resume highlighting marketable mathematical skills and knowledge in each semester of the seminar course (MATH S392/S492). We are giving explicit written feedback on each resume submitted so that students can revise before submitting to employers or graduate schools. Since our majors are required to take the one-credit seminar four times (twice as junior seminar and twice as senior seminar), we are seeing increased attainment for this outcome.

In the program exit surveys, 100% of the students indicate they are somewhat or extremely satisfied with both the education they received in the math program and their interaction with the mathematics faculty. They all mentioned accessibility of math faculty and faculty willingness to help as program strengths. The main weakness mentioned was course availability – both number and frequency of offerings. However, all students acknowledged the reality of viability at a small school.

It should be noted that there were only two graduates from the BS mathematics program in AY 20, and both were excellent students. Katy Price (Magna Cum Laude, GPA 3.90) and Amy Jenson (Magna Cum Laude, GPA 3.98) were both recognized as Outstanding Mathematics Graduates by the UAS Mathematics Faculty.

Amy received a *Biomedical Learning and Student Training (BLaST) Undergraduate Research Experience* grant to conduct research for her capstone paper, titled *Model of yellow fever among Aedes aegypti vectors and human hosts: a SEIRV mathematical model*. Interestingly, her research exposed her to foundational ideas in mathematical modeling that lead to methods quite similar to those being used to model the current Covid-19 epidemic.

Both Amy and Katy began graduate school in Fall 2020. Katy was admitted to the Graduate Program in Mathematics at Oregon State University in Corvallis and was awarded the prestigious Ramanujan-Hardy Fellowship for underrepresented students for her first year of graduate studies. Amy was admitted to the Graduate Program in Mathematics with a Graduate Teaching Assistantship at Montana State University in Bozeman.

The latest news on 2019 graduates includes: *Marshall Johnson* spent the past year as a payroll technician, with some mathematics and physics tutoring on the side, saving up money for graduate school; *Jasper Soriano* started work as the UAS Alumni Relations Manager; *Felix Xian* obtained his commission in the Army ROTC through OCS and plans to go into medicine. Along the way, he briefly worked for the Southeast Alaska Regional Health Consortium (SEARHC) before returning to school to prepare for medical school admission.

Updates on earlier graduates include: *Jerry Stephens* (2016) is currently working for the State of Alaska in the Permanent Fund Dividend Division; *Matt Sperber* (2015) earned his bachelor

degree in Engineering from UAF and secured an Engineer Assistant 1 position with the Alaska Department of Transportation in the SRD-Construction sub-agency; *Andre Bunton* (2015) is continuing his PhD program in Mathematics at the University of Oregon, Eugene; and *Tony Gaussion* (2010) is looking for a university teaching position after earning his PhD in Mathematics from Montana State University.

Close to home, *Gabe Wechter* (2012) has returned to UAS to resume his post as the Testing Supervisor at the Juneau Campus Testing and Learning Center. He joined Auguste and Ben to encourage and support UAS students in their mathematical and statistical adventures. The Learning Center is benefiting from Gabe's MS in mathematics, his background in teaching college level mathematics, and his past experience working at the Juneau Campus Learning Center.

Finally, *Alicia Hughes-Skandjis* (2010) has been working as a Grants Administrator for the State of Alaska in the Department of Health and Social Services for the past several years. In addition Alicia recently got elected (and re-elected) as the District 1 representative to the City and Borough of Juneau Assembly.

6. Program Changes

We did not make explicit changes to the degree program. However, in response to student requests for more courses, we continue to have access to course offerings via the IBA (Intercollegiate Biomathematics Alliance) that our students can take as upper division electives. Specifically in the spring 2021 semester, our students have access to MATH S493: Quantitative Biomathematics and STAT 493: Finite Sampling. We plan to continue offering these electives as long as we are an IBA institutional member.

We also allowed video recording of student capstone presentations this year. Students still answered questions “live” to demonstrate ability to communicate mathematics verbally. The recorded presentations gave an opportunity for communicating mathematics verbally from a different perspective. We are considering making this option available even after returning to the classroom once the global pandemic subsides.

7. Other Considerations

Like all programs, we shifted all courses to online due to the COVID-19 pandemic. Some courses remained synchronous and others were offered in an asynchronous format. The synchronous class meetings occurred via Zoom or Collaborate and had mixed participation. In some classes, class discussions were hampered by the technology. Students might have been disengaged, overwhelmed, or felt unseen. In addition, students often lack the technology to “write mathematics” in a virtual environment.

We offered most exams as take-home exams on the honor system. We like the idea of treating students as honest adults and giving them time to puzzle over creative solutions. However complete solutions for many math problems (both standard and unique problems) are freely and readily available online. Students may be tempted to stop the struggle of the learning process and simply provide a solution located online. This undermines the program philosophy that our primary objective is to help students learn and internalize the process of creating solutions – by synthesizing information and thinking for themselves.