Mathematics Program

School of Arts & Science, University of Alaska Southeast

2020-21 Annual Report on Assessment of Program Learning Outcomes

Jill Dumesnil, Assessment Coordinator

February 25, 2022

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 2020-2021 Academic Year

The average score for the AY 21 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.

	AY 21	Cumulative
Outcome	Average	Average
	Score	Score
1A	4.5	4.764706
1B	4.5	4.294118
1C	3.5	3.705882
2A	5	4.235294
2B	4	3.823529
2C	4	3.823529
3A	4.5	4.411765
3B	4.5	3.941176

3C	4.5	4
4A	3.5	2.823529
4B	5	4.294118
4C	5.5	4.352941

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 year 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 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 21, and both were strong students. Nowielle Corpuz (Cum Laude) was recognized as the Outstanding Mathematics Graduate by the UAS Mathematics Faculty. Nowielle plans to work for a year before considering further study. Our other graduate, Zach White, leveraged his internship with the Segal Group to land a full-time position as a health benefits analyst. He plans to work towards completing a series of actuarial exams.

The latest news on our recent graduates includes: Amy Jenson (2020) completed her first year of graduate school at Montana State University in Bozeman and continued her collaboration with Dr. Jason Amundson at UAS culminating in a publication, "Long-period variability in ice-dammed glacier outburst floods due to evolving catchment geometry," published in The Cryosphere on 25 Jan 2022.

Katy Price (2020) also completed her first year of graduate studies in mathematics at Oregon State University, Corvallis. Because of the COVID-19 crisis, she took all of her courses remotely from Juneau. She looks forward to face-to-face classes in Corvallis this year.

Evan Carnahan (2019) is continuing his studies at the University of Texas, Austin, having switched from Geoscience to the Computational, Science, Engineering, and Mathematics program (basically applied math).

Felix Xian (2019) got accepted into medical school at *Idaho College of Osteopathic Medicine*. He has a military scholarship for school and will start active duty for the Army National Guard once he graduates.

Brendan Moore (2018) has been experimenting with the field of accounting through jobs for various organizations around town, as well as exploring what is behind the Gamestop stock market phenomenon after work.

Tony Gaussion (2010) has started his new job at the Mat-Su campus of the UAA after taking year off subsequent to earning his Ph.D. in Mathematics from Montana State University, Bozeman.

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. We plan to continue offering these electives as long as we are an IBA institutional member.

We also continued allowing 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.

7. Other Considerations

Like all programs, we shifted many 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.