Mathematics Program

School of Arts & Science, University of Alaska Southeast

2021-22 Annual Report on Assessment of Program Learning Outcomes

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Format: This report adheres to the "Report Template" posted 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. The program philosophy remains that our primary objective is to help students learn and internalize the process of creating solutions – by synthesizing information and thinking for themselves.

   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 2021-2022 Academic Year**
   The average score for the AY22 graduates on each outcome is given in the table below along with the cumulative average score from AY17 when the program began this assessment scheme.

Outcome	AY22 Average Score	Cumulative Average Score
1A	4	4.722222
1B	4	4.277778
1C	3	3.666667
2A	5	4.277778
2B	4	3.833333

2C	4	3.833333
3A	4	4.388889
3B	4	3.944444
3C	3	3.944444
4A	3	2.833333
4B	4	4.277778
4C	5	4.388889

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.

Joshua Walsh, AY22 graduate, had a busy year. After attending the 2021 IBA CURE (Cross-Institutional Undergraduate Research Experience) workshop, he and his group (two other students, one from Harvey Mudd College and the other from Scripp's College) went on to give a poster presentation at the 2021 International Symposium on BEER (Biomathmatics and Ecology Education and Research), and then publish an expository paper, titled *Clustering for the Neophyte: An R Shiny App for Self-organizing Maps*, describing the outcome of their project in the undergraduate journal Spora. Josh also received an EPScOR Rolling Travel Award to cover registration costs for MAA MathFest in August 2021, which he attended virtually along with Brian Blitz and Andrzej Piotrowski. Austin Knull graduated in December, 2022 and will be counted as an AY23 graduate.

The latest news on our recent graduates includes: Amy Jenson (2020) completed Master of Science in Mathematics at Montana State University in Bozeman. Amy is continuing her studies at the University of Alaska Geophysical Institute toward a Ph.D. Her doctoral work will involve glaciers -- she is working with Dr. Martin Truffer doing research on Greenland outlet glaciers. Clearly her work at UAS with Dr. Jason Amundson got her hooked on studying mathematical geoscience. In fact, the paper on a research project she and Dr. Amundson started while she was an undergraduate at UAS has been published in The Cryosphere, a not-for-profit international scientific journal that focuses on all aspects of frozen water and ground on Earth and other planetary bodies (see https://tc.copernicus.org/articles/16/333/2022/).

Marshall Johnson (2019) was invited back to assist in the Summer 2022 [IBA CURE](#) workshop in Asheville, NC. After his two-year Covid break from academics, he hopes to get back to studying mathematics soon.

Felix Xian (2019) remains in 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.

Ben Malander (2016) is pursuing graduate studies in mathematics at the University of Wyoming in Laramie after serving several years as Math/Testing Specialist at the Learning Center.

Blake Fletcher (2018) teaches mathematics at Lake Region Union High School in Vermont. Blake visited UAS in spring of 2022 and said "*The skills I learned as a tutor at the UAS Learning Center prepared me well for teaching. By the time I graduated from UAS I had years of experience reading, processing, interacting with students, and reacting to students' work before I ever stepped in the classroom. My favorite outdoor activity continues to be disc golf. I got hooked on this sport while I was a student at UAS, and I am thankful to my advisor Brian Blitz for overseeing the disc golf club that I was the president of.*"

Tony Gaussion (2010) continues in his position as assistant professor at the Palmer campus of the UAA utilizing his Ph.D. in Mathematics from Montana State University, Bozeman.

Stephen Perry (2006) has moved back to the U.S. from Germany where he earned a graduate degree in mathematics and worked for several years.

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.