Self-Study

Mathematics Program Review

College of Arts and Sciences
Dakota State University
March 31, 2023

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Part 1 - Institutional History

Heritage: 1881-1982

Dakota State University was established in 1881 as the first teacher education institution in Dakota Territory. Teacher education remained the primary mission of the institution through the 1950s. However, in response to the changing needs of South Dakota in the 1960s, the university began to expand its role to include degree programs in the liberal arts and business. In 1980, South Dakota welcomed a major new industry into the state: the banking and credit card industry. The success and growth of this new industry, as well as the success of other information- oriented, computer-based industries in the state, prompted the state's leadership to carefully examine the degree programs being offered at the public institutions of higher education within the state. After lengthy discussions, leaders in state government, the banking and information services industries, and the Board of Regents agreed to develop new degree programs at one institution and then to use the experience and knowledge from this development to expand programs throughout the state's public higher education system.

Mission Change: 1983-1984

In 1984, the Legislature of the State of South Dakota (South Dakota Codified Law 13-59-2.2) assigned Dakota State University the role and mission of developing technology-based degree programs in information systems, business, teacher education, and allied health care services at both the undergraduate and graduate levels. The Legislature provided $2.6 million in additional operating funds to support a three-year mission change at DSU. During the initial phase of the transition, the academic programs of the institution were reviewed. Degree programs were phased out if they were duplicated at the other five Regental institutions or if graduates would enter an over-supplied marketplace. New information systems programs, computer equipment, and facilities were approved for DSU. During the transition, special attention was given to ensure that all students in programs slated for phase-out received a full opportunity to complete those programs. To ensure the continuation of education quality, when the number of students continuing in a program became very small, a special faculty-mentoring program was developed. The second phase of the transition began in August 1984, with the development of degree programs that integrated computers and information technologies into traditional academic subjects and added coursework specific to the computer and information systems areas. Existing 2 faculty were retrained, and new faculty were hired. Programs to implement the research and service aspects of the new role and mission were started. This was a period of stress for the campus, but it was also a period of great exhilaration with faculty and staff invigorated and renewed by the need for innovation, adaptation, and change. Some faculty and staff were unable to adapt to the changing conditions and left the university, but those who stayed on for the ride were justly proud of their accomplishments. Realizing that the innovative programs being developed at DSU were expensive, private industry and state government provided the university with additional financial resources. Consultants from state agencies and from national corporations also provided assistance and guidance that contributed greatly to the success of the mission change.

Since the Mission Change: 1984- Present

In 2015, as part of the launch of DSU's 2020 Strategic Plan, "Excellence through Innovation", DSU leadership and employees reaffirmed the Institutional Mission, Vision, and Values.

Mission

> DSU provides learning that integrates technology and innovation to develop graduates ready to contribute to local, national, and global prosperity.

Vision

> • Building upon its distinctive mission, DSU will become:
> • The university of choice for those seeking a student-centered institution that offers innovative programs grounded in teaching, research, technology, scholarship, and service excellence.
> • An academic community that serves as an economic engine in local, national, and global markets.
> • A campus recognized for its achievements in continuous quality improvement.

Values

> • Student success.
> • University-wide Excellence.
> • Distinction in Teaching, Scholarship, and Service.
> • Academic Freedom and Integrity.
> • Diversity, Respect, and Inclusion. 3
> • Continuous Improvement.
> • Community, Collaboration, and Communication.
> • Technology and Innovation inside and outside the classroom.

As the institution endeavors to articulate its mission in the fullest way, our degree programs are scrutinized each year to ensure they remain on the cutting edge relative to technology to enhance and support instruction and address work force demands. When new degree programs are proposed by the colleges, they must clearly satisfy the "Is it compatible with our mission?" question before any additional planning is done. To date, those curriculum development efforts have resulted in 27 bachelor's degrees, 6 associate's degrees, and 24 certificate programs. These programs range from Cyber Security to Elementary Education to Respiratory Care to Business Administration. In the delivery of graduate education, the institution also offers seven master's degrees, certificates, and four doctoral degrees.

DSU Rising Initiative

In 2017, Dakota State University began a transformational five-year capital investment initiative called DSU Rising. The initiative is the result of a $30M donation from philanthropists Miles and Lisa Beacom and Denny Sanford. The donation will allow for the construction of an $18M, 40,000-square-foot research and development building for the Madison Cyber Labs (MadLabs). The funds also provide for additional scholarships, new program development, hiring of more faculty and staff, and support the university's intent to bring 5G network capabilities to Madison, the region, state, and eventually the nation. In addition, South Dakota Governor Dennis Daugaard pledged $10M to Dakota State, monies from the research and development Future Fund. U.S. Senator Mike Rounds(R-SD) has pledged to help Dakota State earn $20M in federal funds to advance DSU's cyber mission.

Madison Cyber Labs

On Jan. 31, 2018 Governor Dennis Daugaard signed House Bill 1057 into legislation which permitted the demolition of DSU's Lowry Hall and construction of the Madison Cyber Labs, or MadLabs. The Madison Cyber Labs will build on DSU's expanding capabilities and strengths to establish a hub of cybersecurity and cyber operations expertise, research, and economic development in South Dakota. 4 The MadLabs will include resources (labs, networking, hardware, software), partners (government, business and industry, nonprofits), people (undergraduate, graduate, professional, teachers, researchers, interns and collaborators), programs (certificates, A.S., B.S., M.S. and Ph.D.) and innovation (interdisciplinary and multidisciplinary groups and projects, forensics and security). Construction of the MadLabs building began in 2018, with full occupancy expected in Fall 2019. Already known as a national leader for cyber security and having a mission focusing on technology and information technology, DSU earned a 2012 National Security Agency designation as a Center for Academic Excellence in Cyber Operations. The NSA designation comes with levels of responsibility to the Agency regarding Knowledge Units and student success. DSU's We Are Rising initiative intends to put South Dakota on the leading edge of cybersecurity with new economic development clusters creating high paying jobs and giving former students the ability to 'come home' to cutting-edge companies and a growing regional economy.

Student Demographics

Prior to the mission change in 1984, the majority of DSU students lived within a 50-mile radius of the campus. Most were traditional students coming to the institution directly from high school. Since the mission change, the DSU audience and student population has changed markedly. Immediately after the mission change, enrollment plunged a frightening 27.6 percent the first year, followed by another 12.6 percent decline the second year. But the new curriculum changes, combined with new institutional vigor, provided the institution with unprecedented enrollment growth and stability.

Accreditation History

Dakota State University was granted accreditation by the Higher Learning Commission for a period of ten years in 1961 and accreditation has been continued after each comprehensive visit. The institution's most recent comprehensive visit, in October 2018, resulted in a positive review without any requirement for monitoring reports. Currently, DSU is participating in the Higher Learning Commissions' Academic Quality Improvement Program (AQIP). Six AQIP Categories provide a framework for examination. The AQIP Categories are:

- Helping Students Learn
- Meeting Student and Other Key Stakeholder Needs 5
- Valuing Employees
- Knowledge Management and Resource Stewardship
- Planning and Leading
- Quality Overview

Each AQIP Category deals with a related group of key processes and encourages an organization to analyze, understand, and explore opportunities for improving these processes and the interrelationships among them. The AQIP process works in tandem with our existing strategic planning and project review processes. It provides a framework that focuses on data analysis and the achievement of its published goals and objectives. The alternate accreditation review process is every ten years. With AQIP, our accreditation is reviewed yearly in cycles and culminates in a Reaffirmation of Accreditation at the end of a seven-year cycle.

College of Arts and Sciences

The College of Arts and Sciences offers a variety of programs and courses leading to many successful career opportunities. Computer technology is integrated throughout all majors. The College also offers the vast majority of DSU's required 30-credits of general education courses, serving as a backbone for all degrees.

The College of Arts and Sciences offers degree programs in Analytical Science, Biology, Computer Game Design, Digital Arts and Design, English for New Media, and Mathematics. In addition to these degree programs, the College of Arts and Sciences offers majors, minors, certificates, specializations, and courses which qualify students to apply for admission to professional schools and programs.

Faculty for the College of Arts and Sciences are principally located in two campus buildings: Faculty in Speech and Theater, English, and Digital Arts and Design are principally located in Beadle Hall. Mathematics, Science, and Social Science faculty are housed in the C. Ruth Habeger Science Center.

History of the Mathematics Program

Mathematics for Information Systems and Mathematics Education degrees were established at the time of the institutional mission change in 1984-1985. These degrees fit well within the defined focus of DSU on computer integration into the curriculum and serving the needs of the K-12 education community. Mathematica, Stella, Excel, Geogebra, WebAssign, MyMathLab, and MyStatLab are the primary software packages used in mathematics courses. They are all available to be loaded onto student tablets or accessible by students anywhere/anytime from the VM server (accessed through the internet to share computer software).

As previously noted, DSU implemented a wireless mobile computing initiative in the fall of 2004, mandating student leases of tablet PCs with a nominal user fee for all fulltime freshman and sophomores and encouraging upperclassmen to opt into the lease. Most math majors opted into the program the first year and all students were required to have a tablet by the fall of 2007. Nearly all mathematics courses have an online presence utilizing an online course management system. These are examples of DSU's continuous efforts to incorporate the latest technology into the curriculum at the university and department level.

To promote efficiency and expand opportunities for students, the Math for Information Systems and Math Education degrees were, in 2019-2020, merged into a single B.S. in Mathematics

degree with four Specializations: Information Systems, Secondary Education, a new Specialization in Cryptography, and a new Intermediate Education Specialization. This maintained the options of the previous Math for Information Systems and Math Education degrees but also increased opportunities for mathematically inclined students with the addition of the two new Specializations. Most of what follows in this Self Study report will focus on the Information Systems and Cryptography Specializations. The College of Education is accredited by the Council for the Accreditation of Educator Preparation (CAEP) and submitted their self-study report on July 29, 2022. Our virtual visit is April 30 - May 2, 2023. The Math Education and Intermediate Education specializations are reviewed as part of this process.

Previous Mathematics Program Review (2014)

The last institutional program review for the Mathematics for Information Systems degree was in April 2014, conducted by Dr. Asok K. Sen, Ph.D. from the Department of Mathematical Sciences at Indiana University Purdue. Dr. Asok noted the strengths of DSU's Mathematics programs as effective use of technology, excellent job placement of graduates, quality of the faculty, consistency with university mission, program assessment, low student to faculty ratio, and support of other academic programs on campus. The weakness of the programs was identified as low enrollment and the concurrent problem of offering upper-level courses on a more frequent basis. University growth has helped to alleviate these issues to an extent.

Part 2 – Mathematics Discipline Trends

Current Trends

The report by the MAA (CUPM Curriculum Guide 2015) on undergraduate programs recognizes the "widening variety" of programs in the mathematical sciences across the county. As is certainly the case at DSU, mathematics is mostly a service discipline, however, it is also more and more relevant in many new and emerging fields such as Artificial Intelligence and Machine Learning. As such, curriculum is not as standardize as it once was, and technology is changing what and how things are taught. Equally important are societal changes and understanding the strengths and weaknesses of incoming students as well as their goals and aspirations is an important issue. Most students taking mathematics courses are not major in mathematics. This is still a particularly critical and important aspect of the Mathematics Program at DSU.

A significant percentage of students on campus take at least one mathematics course beyond what is required for General Education and a majority of our course enrollments are students who are not majoring in mathematics. Additionally, there has been a prolific increase in the availability of online mathematics courses, both at DSU and elsewhere, which both provides opportunities for students but also presents distinct challenges to mathematics programs, including at DSU.

Influence of Current Discipline Trends on DSU's Mathematics Program

The use of technology has changed mathematics and mathematics education. Computer based course management systems and tools enable the collection and grading of daily assignments and quizzes. Faculty can check and verify that students are doing quality work without burying themselves under a mountain of paperwork as well as delivering course content efficiently. Not

only has it changed the way in which faculty teach, but it has also changed what faculty teach, although probably not as much as it should. For example, graphing techniques used to be a major focus in both College Algebra and Calculus I, whereas today the topic is barely mentioned in modern textbooks. Handheld calculators, shareware computer programs, and online resources such as Desmos and Wolfram Alpha provide all the information faculty and students need, not to mention the capabilities of computer algebra systems which are able to perform any paper-and-pencil calculation. The question remains, however, as to the role that various "old-fashioned" teaching and learning methods, such as memory work and paper-and-pencil calculation, plays in the development of mathematical understanding and thinking. DSU faculty use technology as a tool to solve and analyze problems throughout the curriculum but firmly believe that technology should not replace paper-and-pencil skills and conceptual understanding but rather should supplement and expand the realm of what is possible in the mathematics classroom. On the flip side, modern technology also presents new challenges for mathematics education. Online homework management systems are useful when used properly by students. Many, however, have learned to manipulate the system which is causing many faculty to reevaluate the use of such tools. Online resources available to and often used by students to "do" assignments present another challenge as any students can obtain the solution to almost any problem with the assistance of various online sites these days. Consequently, faculty are having to review and modify their use of out-of-class assessments in many cases. Unfortunately, this is taking time away from content discussion in class (more assessments need to be done in class) and is resulting in less in-depth assessment.

Part 3 - Academic Program, Curriculum, and Instruction

Academic Degrees Offered

Students majoring in a Bachelor of Science in Mathematics degree have one (or more) of four Specializations: Information Systems, Cryptography, Secondary Education, or Intermediate Education. Additionally, majors in other programs may elect one of four mathematics minors: Applied, 5-12 Endorsement, K-8 Endorsement, or Elementary Education. Many Computer Science students either double major in Mathematics, with either the Information Systems or the Cryptography Specialization, or they obtain an Applied Mathematics minor.

Students obtaining a degree in Computer Science, Computer Game Design, Analytical Science, Biology, or Biology Education only need to complete the mathematics component of the program to obtain a second major in Math with either the Information Systems or Cryptography Specialization.

Most colleges and universities in the region offer mathematics and math education degrees. All institutions in the South Dakota Board of Regents (SDBOR) system have mathematics programs and all, except the School of Mines and Technology, have math education programs. However, the math degrees at DSU are fundamentally different from the other SDBOR institutions because of the emphasis on the integration of computer technology and the information systems / computer science component. The double major option is unique within the SDBOR system and regionally St. Olaf is the only other school that seems to have a similar option.

Specializations

The Mathematics for Information Systems Specialization consists of 32 credit hours of required mathematics coursework. Students whose only major is Mathematics (they are not double majors) must also complete 18 credits leading to a minor in Information Systems and 18-21 credits leading to a minor in an applied field. The mathematics coursework consists of a required 20 credit core (including Math 123: Calculus I which also satisfies a SDBOR General Education requirement) and an additional 12 credits of higher-level mathematics electives. Students in the Cryptography Specialization complete 41 credit hours of mathematics coursework, a Computer Science minor, and a Cyber Operations minor. Students with a major in Computer Science or a major in Cyber Operations need only complete the mathematics coursework to earn the Cryptography Specialization.

Independent Study / Special Topics Courses

Faculty routinely offer Special Topics and Independent Study courses for students, helping them complete course requirements on a timely basis, offering courses that would not be offered due to low enrollment rules, and offering content outside the normal curriculum for students with a desire to learn about a specific topic. This allows faculty to provide breadth, depth, and continuity to DSU's mathematics curriculum that would not otherwise be possible.

Below are the Special Topics and Independent Study offerings since Fall of 2015. It should also be noted that these offerings also provide a degree of professional development for faculty, encouraging them to explore areas of mathematics outside the standard curriculum. This is also an important tool to develop and maintain faculty morale. Thus, there are definite benefits of these offerings to both students and faculty. It would be interesting to consider making Special Topics a regular/annual component of the schedule each year.

YEAR	SEMESTER	COURSE	Subject	COURSE#	SECTION#	# ENROLLED
2015	Fall	none offered				
2016	Spring	none offered				
2016	Fall	IS: Quaternions	MATH	491	D01	1
2017	Spring	Topics: Cryptography	MATH	492	D01	16
2017	Fall	IS: Math Capstone	MATH	491	D01	4
2018	Spring	IS: Math Modeling	MATH	491	D01	9
2018	Spring	Topics: Game Theory	MATH	492	D01	27
2018	Fall	IS: Math Capstone	MATH	491	D01	4
2019	Spring	IS: Linear Algebra	MATH	491	D01	7
2019	Fall	Topics: Signals and Systems	MATH	492	D01	14
2020	Spring	IS: Abst Algbra & Categ.Theory	MATH	491	D01	1
2020	Fall	IS: Cryptography & Codes	MATH	491	D01	1
2021	Spring	none offered				
2021	Fall	IS: Algebraic Number Theory	MATH	491	D01	1
2022	Spring	none offered				
2022	Fall	IS: Algebraic Combinatorics	MATH	491	D01	1
2022	Fall	Topics: Intro. Mathem. Biol	MATH	492	D01	1

Supporting the System-wide Goals for General Education
The mathematics courses that satisfy the general education curriculum are designed with the goal of developing mathematical thinking and analytic communication skills. Students learn problem solving techniques, explore real world problems, form conjectures, and relate course content to the real world as well as other disciplines. In addition to being in the Mathematics degree, Math 123: Calculus I, Math 125: Calculus II, Math 225: Calculus III, Math 201: Introduction to Discrete Mathematics, and Math 281: Introduction to Statistics can also be used to satisfy the SDBOR general education mathematics requirement. All general education mathematics courses at Dakota State University support the following system (SDBOR) goal:

GOAL #5: *Students will understand and apply fundamental mathematical processes and reasoning.*
Student Learning Outcomes: As a result of taking courses meeting this goal, students will:
1. Use mathematical symbols and mathematical structure to model and solve real world problems.
2. Demonstrate appropriate communication skills related to mathematical terms and concepts.

Undergraduate Research
The mathematics program provides students with the opportunity to complete undergraduate research/scholarly projects, and the Center of Excellence Honors Program (students earn a Center of Excellence minor) requires a Capstone Experience from the approved list or from the students' major. Student research has included work on modeling bird populations, computer simulation of foraging behavior, and epidemiological modeling (Dr. Jeffrey Palmer, advisor), finding Green's functions for boundary value problems associated to partial difference equations (Dr. Rich Avery, advisor), simulations of queuing theory, analysis of Mastermind, factorization algorithms, and computational graph theory (Dr. Mark Spanier, advisor).

Computer Technology Integration
DSU mathematics faculty have an online presence, utilize an array of course management systems (including Geogebra, Sage, D2L, WebAssign, MyMathLab, and MyStatLab), and utilize a variety of computer software packages and programs in their classrooms. The computer algebra system *Mathematica* and the dynamic modelling software *Stella* are available on the VM server.

Instructional Methodologies
Faculty incorporate various instructional methodologies including but not limited to lecture, discussion, group problems, cooperative learning, directed reading, and multimedia supplemented with computer technology in their courses. Computer use in the classroom, when appropriate to the topic, is highly encouraged. Additionally, the faculty have put a great deal of time and effort into creating documents and course materials that are accessible online and several have received course redesign grants principally for the development and/or revision of online courses.

Faculty and Student Interaction
One of the program's strengths is the focus on students and the opportunity for students and faculty to work closely together. The opportunity to interact frequently with students allows the faculty

members to provide educational opportunities which more closely match the student's career goals.

Student Progression

Incoming students planning to major in Mathematics, Computer Science, or Computer Game Design should take Math 123: Calculus I in the first fall semester when they meet the prerequisite (placement, trigonometry, or concurrent enrollment in trigonometry), ideally fall of their first year. They should follow this with Math 125: Calculus II in the spring. Students should take Math 201: Introduction to Discrete Mathematics, Math 281: Introduction to Statistics, and Math 315: Linear Algebra during their second year. These courses develop a broad content background and level of mathematical maturity needed for most upper-level mathematics courses and prepare students for Math 316: Discrete Mathematics during fall semester of their third year. During their third and fourth years, students should enroll in upper-level electives that are available.

A student's academic record at DSU is accessible to his or her advisor through the web-based Banner Information interface or Trojan Connect (also known as Navigate, a student success management system by EAB). Advisors and students can view schedules and transcripts. They can also perform a program evaluation that indicates which requirements remain in a student's program. The system also allows for online searching of courses, and students may register for classes after consulting with their advisor.

Course Enrollment

Enrollment numbers for the past 7 academic years are shown below. Math 120: Trigonometry (the prerequisite/co-requisite for Math 123: Calculus I) has seen relatively stable demand (on-campus) and declining numbers online, possibly due to our lack of staffing to offer online sections consistently. Math 123: Calculus I numbers are again, post-pandemic, increasing. Given adequate staff we would certainly consider increasing the number of sections thus reducing class sizes and providing a better experience for our students. Math 125: Calculus II has experienced a sharp decline since the pandemic. It is not clear if fewer of our students are taking this course or if they are finding more online options. Demand for Math 201: Introduction to Discrete Mathematics has experienced an even larger growth due to the popularity of the Cyber Operations and Computer Science programs at DSU. Math 281: Introduction to Statistics has seen recent growth as well, mostly due to growth in the Computer Network and Security program and is another course which, given staffing, could be added to our online offerings.

The required courses in the core (Math 123, Math 125, Math 201, Math 281, Math 315, and Math 316) of the mathematics degree are offered every year. At present Math 123, Math 201, and Math 281 are available both Fall and Spring every year. Courses in the elective block (Math 282 and all courses above Math 316) are offered on a rotating basis depending on demand – the goal has been to offer 2-3 of these higher-level electives each semester so that students can complete their degree requirements in a timely fashion.

DSU Mathematics Course Enrollment

COURSE	COURSE#	TITLE	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022
MATH	120	Trigonometry	65	58	51	39	35	58	65
		Online	39	43	46	45	0	32	19
MATH	123	Calculus I	58	59	58	56	46	51	62
		Online	42	15	28	41	18	18	15
MATH	125	Calculus II	28	25	18	25	24	24	12
		Online	0	0	0	0	0	0	0
MATH	201	Intro. to Discrete Mathematics	49	77	172	121	181	127	176
		Online	63	64	82	104	92	94	103
MATH	225	Calculus III	0	0	0	0	0	0	7
		Online	0	0	0	0	0	0	0
MATH	281	Intro. to Statistics	44	58	58	71	74	93	83
		Online	20	0	0	0	0	0	0
MATH	282	Mathematics of Games	35	40	44	50	48	44	37
		Online	0	0	0	0	0	0	0
MATH	315	Linear Algebra	15	14	18	0	19	15	25
		Online	14	18	18	20	17	13	21
MATH	316	Discrete Mathematics	65	47	41	44	43	40	50
		Online	40	70	67	78	55	41	40
MATH	318	Adv. Discrete Mathematics	13	0	0	0	0	0	0
		Online	0	0	0	0	0	0	0
MATH	321	Differential Equations	0	16	0	10	0	15	0
		Online	0	0	0	0	0	0	0
MATH	361	Modern Geometry	0	0	14	0	13	0	7
		Online	17	0	9	0	16	0	12
MATH	381	Intro. to Probability & Statistics	13	0	0	7	0	5	0
			0	0	0	18	0	4	0
MATH	413	Abstract Algebra	0	12	0	7	0	9	0
		Online	18	8	0	13	0	16	0
MATH	418	Mathematical Modeling	0	0	0	0	8	0	7
		Online	0	0	0	0	0	0	0
MATH	436	Cryptography & Codes	0	0	0	24	23	24	19
		Online	0	0	0	24	27	20	25
MATH	437	Cryptography & Codes	0	0	0	0	5	10	7
		Online	0	0	0	0	16	11	10
MATH	471	Numerical Analysis I	0	0	0	0	0	0	0
		Online	0	0	0	0	0	0	0
MATH	475	Operations Research	0	0	20	0	0	0	0
		Online	0	0	6	0	0	0	0

Course Enrollment Dependence Upon Other Programs at Dakota State University

Without the support of the Computer Science program the mathematics program would not exist. Computer Science majors are required to take Math 123: Calculus I, Math 201: Introduction to Discrete Mathematics, Math 281: Introduction to Statistics or Math 381: Introduction to Probability and Statistics, Math 316: Discrete Mathematics, and 6 credits of math electives – a total of 19 credits without which the mathematics degree could not persist. These are largely the same students who populate the Mathematics for Information Systems and Mathematics for Cryptography Specializations by electing to take advantage of DSU's unique double major opportunity.

The Mathematics Secondary Education Specialization, Mathematics Intermediate Education Specialization, Analytical Science, Computer Game Design, Computer and Network Security and Biology programs also support courses in the mathematics program.

Part 4 - Program Enrollment and Student Placement

Total Enrollment

Program enrollment is based on the number of students enrolled in at least one DSU class with an active math program as of fall census. If a student is dually enrolled in two programs, the student will be counted in both programs.

College enrollment is based on the number of students enrolled in at least one DSU class with an active program in the College of Arts & Sciences as of fall census. If a student is dually enrolled in a college, the student will be counted in both colleges (CSC - Beacom & Math - AS). However, if a student has multiple active programs in the same college, the student will only be counted once at the college level.

University enrollment is based on the number of students enrolled in at least one DSU class as of fall census. If a student is enrolled in multiple programs, the student is only counted once at the university level.

Table 1: Math Program, College, and University Enrollments

	Fall 2015	Fall 2016	Fall 2017	Fall 2018	Fall 2019	Fall 2020	Fall 2021
Math for Info. Systems *(now a specialization)*	21	24	21	28	25	14	5
Math Education *(now a specialization)*	23	21	19	19	17	9	6
Mathematics BS?						13	23
College of Arts & Sciences	401	383	391	366	369	325	337
University Enrollment	3145	3190	3307	3382	3268	3186	3219

Table 2: Student Diversity – Enrollment by Gender for the Math Programs

Gender	Fall 2015	Fall 2016	Fall 2017	Fall 2018	Fall 2019	Fall 2020	Fall 2021
Math for Info. Systems *(now a specialization)*							
Female	5	4	5	9	7	3	1
Male	16	20	16	19	18	11	4
Mathematics BS							
Female						5	11
Male						8	12
Math Education							
Female	8	9	13	13	9	6	5
Male	15	12	6	6	8	3	1

Table 3: Student Diversity – Enrollment by Ethnicity for the Math Programs

Ethnicity	Fall 2015	Fall 2016	Fall 2017	Fall 2018	Fall 2019	Fall 2020	Fall 2021
Math for Info. Systems *(now a specialization)*							
White	17	23	21	25	22	12	5
Non-White*	4	1	0	3	3	2	0
Mathematics BS							
White						11	20
Non-White*						2	3
Math Education							
White	21	20	17	18	17	9	6
Non-White*	2	1	2	1	0	0	0

*Non-white group includes all those from underrepresented minorities (URM/ALANA), international students, and unknown

Employment Potential and Placement

Nearly 100% of graduates of the Mathematics degree program found placement in either an appropriate position or chose to continue their education in graduate school. The following table shows the positions and geographic locations of mathematics degree graduates for whom data were available since the last mathematics program review (2014).

Term	Degree	Employer	Position	City	State
2016SP	D.BS.MATHS	Sanford Research	Research	Sioux Falls	SD
2016SP	D.BSED.MATH	Deer Valley High School	Teacher	Phoenix	AZ
2016SP	D.BSED.MATH	West Sioux High School	Teacher	Hawarden	IA
2016SP	D.BSED.MATH	Alcester Hudson Schools	Teacher	Alcester	SD
2017SP	D.BS.MATHS	Omnitech	Software Engineer	Sioux Falls	SD
2017SP	D.BS.MATHS	SD Unified Judicial System	Computer Support Specialist	Pierre	SD
2017SP	D.BS.MATHS	SD Bereau of Info & Telecomms	Software Engineer	Pierre	SD
2017SP	D.BS.MTIS	Moore Counseling Services	Technology Services	Sioux Falls	SD
2017SP	D.BS.MTIS	Pursuing Computer Science MS @ USC	-	-	-
2017SP	D.BSED.MATH	Chester School District	Teacher	Chester	SD

Term	Degree	Employer	Position	City	State
2017SP	D.BSED.MATH	Continuing Education @ DSU (MSET)	-	-	-
2017FA	D.BS.MTIS	Hard Rock	Financial Analyst	Sioux City	IA
2018SP	D.BSED.MATH	George McGovern Middle School	Science Teacher	Sioux Falls	
2018SP	D.BSED.MATH	Huron School District	Math Teacher	Huron	SD
2018SP	D.BS.MIS	Carsforsale.com	Software Developer	Sioux Falls	SD
2018FA	D.BS.MTIS	Premier Bankcard	Analyst	Sioux Falls	SD
2018FA	D.BS.MTIS	Sanford Health	IT QA Specialist	Sioux Falls	SD
2018FA	D.BSED.MATH	Harrisburg School District	Math Teacher	Harrisburg	SD
2018FA	D.BSED.MATH	Colome School District	Math Teacher	Colome	SD
2018FA	D.BSED.MATH	CE @ DSU (MSED.EDTC)			
2019SP	D.BS.MTIS	Innovative Systems	Software Developer	Mitchell	SD
2019SP	D.BS.MTIS	Omnitech	Software Engineer	Sioux Falls	SD
2019SP	D.BS.MTIS	Econofoods	Stocker	Cannon Falls	SD
2019SP	D.BS.MTIS	Sanford	Software Test Engineer	Sioux Falls	SD
2019SP	D.BSED.MATH	Marquette Academy	Math Teacher	Ottawa	IL
2019FA	D.BS.MTIS	Guidehouse	Patient Account Rep	Mitchell	SD
2019FA	D.BS.MTIS	Data Recognition Corporation	CS Agent	Minneapolis	MN
2019FA	D.BS.MTIS	Peppermill	Database Administrator	Wendover	NV
2019FA	D.BSED.MATH	Sarasota Military Academy Prep School	Math Teacher	Sarsota	FL
2020SP	D.BS.MTIS	Federated Insurance	Associate Systems Dev	Owatonna	MN
2020SP	D.BS.MTIS	Federated Insurance	IS Associate Systems Dev	Owatonna	MN
2020SP	D.BS.MTIS	FAST Enterprises	Implementation Consultant	Augusta	ME
2020SP	D.BS.MTIS	CE @ DSU (MS.CSC)			

Term	Degree	Employer	Position	City	State
2020SP	D.BSED.MATH	Hamlin School District	Teacher	Hayti	SD
2020SP	D.BSED.MATH	Castlewood School District	Teacher	Castlewood	SD
2020SP	D.BSED.MATH	Woonsocket School District	Math Teacher	Woonsocket	SD
2020FA	DBS.MTH	CE @ Clemson University (MS CSC)			
2020FA	DBS.MTS	Amazon Web Services	Software Engineer	Seattle	SD
2020FA	DBS.MTS	Epic	Software Developer	Madison	WI
2020FA	DBS.MTS	FAST Enterprises	Technical Team Member	Centennial	CO
2021SP	DBS.MTH-INS	C2G Inc.	Software Engineer	El Segundo	CA
2021SP	DBS.MTS	CE @ DSU (MS.CSC)			
2021SP	DBS.MTS	State Street	Product Support Analyst	Boston	MA
2021SP	DBS.MTS	Sandhills Global	Mobile Appe Developer	Lincoln	NE
2021SP	DBSED.MTH	Kimball School District	Math Teacher	Kimball	SD

Part 5 - Faculty Credentials

The principal faculty involved in the Mathematics degree program are listed below.

> Jeffrey Palmer, Professor of Mathematics, Ph.D., Washington State University
> Rich Avery, Professor of Mathematics, Ph.D., University of Nebraska
> Mark Spanier, Associate Professor of Mathematics and Cryptography, Ph.D. North Dakota State University
> Richard Wicklein, Assistant Professor of Mathematics, Ph.D., North Dakota State University
> Hannah Altmann, Assistant Professor of Mathematics, Ph.D., North Dakota State University

A vita for each faculty member is contained in Appendix C.

Faculty Staffing

DSU has just completed a successful search for two new tenure track faculty positions which will begin Fall 2023. This is in response to the increasing demand for support courses within the mathematics program (particularly Trigonometry, Calculus I, Introduction to Discrete Mathematics, Introduction to Statistics, and Discrete Math) necessitated by the growth of the Computer Science, Cyber Operations, Computer and Network Security, and the Computer Game Design majors and the growth in online mathematics courses.

Faculty and/or Student Research

Dr. Jeffrey Palmer has research interests in the areas of mathematical epidemiology, foraging theory, and metapopulation dynamics. He has published several papers, has co-authored a book on the Birds of South Dakota, and has worked with numerous undergraduate students on research projects. Dr. Palmer also developed and maintains the online database for Seasonal Bird Observation Reports for South Dakota Bird Notes.

Professor Avery's mathematical research interests are in fixed point theory. He is particularly interested in methods of converting boundary value problems to fixed point problems, fixed point theorems utilizing concave and convex functionals, verifying the existence of solutions to boundary value problems using fixed point theorems, and the use of iteration to approximate solutions of fixed point problems that correspond to boundary value problems. His current research focuses on a generalization of Banach's Theorem applied to Boundary Value Problems. He has published over seventy refereed manuscripts in mathematics journals. Currently he serves as an editor for the Journal of Function Spaces, Mathematical Problems in Engineering and the Journal of Fixed Point Theory.

Dr. Spanier's area of mathematical research investigates problems in approximation and optimization theory with applications to analytic number theory, signal processing, and machine learning/artificial intelligence.

Dr. Rich Wicklein earned a Bachelor of Science degree in Mathematics-Education and Secondary Education from Mount Mercy College in 2006 and a Ph.D. in Mathematics from North Dakota State University in 2013. His research interests include commutative algebra, homological algebra, and combinatorial games. He has six publications in commutative algebra and has supervised undergraduate research in mathematical games played on graphs.

Dr. Hannah Altmann's research interests lie in commutative algebra. In particular, she works with Differential Graded (DG) modules over DG algebras. Her research has been published in the Journal of Algebra and the Journal of Algebra and its Applications, and she has published an article in the book *Women in Commutative Algebra* as part of an Association for Women in Mathematics (AWM) Series. She has also collaborated with undergraduates on research projects involving applications of linear algebra and abstract algebra.

Service to Community

Dr. Palmer is currently the Mathematics Program Coordinator at DSU and has served on numerous institutional committees over the years. He was, until recently, a member of the statewide Mathematics Discipline Council and serves as Treasurer for the South Dakota Academy of Science. Additionally, Dr. Palmer is a Past President Director and member of the Rare Bird Records Committee of the South Dakota Ornithologists' Union.

Dr. Avery is broadly trained in mathematics and can teach any of the mathematics courses offered by Dakota State University. He enjoys teaching Discreet Mathematics as well as the mathematics courses required of education majors. He has been the primary instructor of the Math Concepts courses (math for elementary education majors courses) at Dakota State University for many years. He is one of the secondary math education advisors on campus and was originally trained as a high school mathematics teacher. Dr. Avery is a member of the DSU Provost Advisory Council and the Shared Governance committee as well as the Board of Regents Math and General Education Discipline councils. He has served as the General Faculty President, Vice President, and Secretary.

Dr. Spanier is currently the general faculty president at DSU and serves on many university committees. Dr. Spanier is a member of the leadership team of South Dakota, Iowa, and NEbraska COmmunity for Mathematics Inquiry in Teaching (SINE-COMMIT) and holds officer roles within the Nebraska-Southeast South Dakota (NESeSD) Section of the MAA. As 2021-2022 Program Chair, he organized the Spring 2022 NESeSD Sectional Meeting. Starting in 2022 he was elected as co-communications officers for the NESeSD Section. Dr. Spanier is the co-director of DSU's Artificial Intelligence (AI) Lab and faculty advisor of the AI Sweden + DSU Industrial Immersion Exchange Program.

Dr. Wicklein currently serves as a representative on the DSU Curriculum Committee, the math program lead for general education, and a DSU representative on the Math Discipline Council for the SDBOR. He has served on many other committees at DSU and previous employers.

Dr. Altmann has served on the Academic Advisory Board, the Code of Conduct Board, and the Scholarship Committee, along with several hiring committees. She recently assisted with the Mathematical Association of America (MAA) Conference held at DSU.

Part 6 - Academic and Financial Support

Resources providing academic support to faculty and students in Mathematics include the Karl E. Mundt Library, a wireless computer infrastructure, and classrooms equipped with computer projection systems.

Karl E. Mundt Library & Learning Commons

The Karl E. Mundt Library & Learning Commons provides a wide range of library services as well as a diverse collection of reference and informational materials for the use of the faculty and staff of Dakota State University. The library exists to serve as an archive of accumulated knowledge, a

gateway to scholarship, and a catalyst for the discovery and advancement of new ideas. In fulfilling its obligation to provide knowledge to the University and the scholarly community at large, the library collects, organizes, and provides access to recorded knowledge in all formats. The library faculty initiates discussions and proposes creative solutions to the information challenges facing the University and the scholarly community. The library's faculty and staff actively participate in providing quality service, access, instruction, and management of scholarly information. It is one of the main sources of knowledge and reference for students in mathematics.

The mission of the Karl E. Mundt Library & Learning Commons is to meet the information needs of the students, faculty, and staff of Dakota State University and to support the University's stated mission and goals. The college and library faculty work together to plan the development of library resources to purchase the most appropriate materials to achieve the educational objectives of Dakota State University. The total collection contains approximately 175,000 items (physical and electronic), ranging from books, journals, and other formats that support all subjects the University offers.

The Karl E. Mundt Library boasts tremendous access to the resources needed by anyone pursuing a mathematics-related research topic. Even though the library does not have an extensive list of books related to mathematics, they are readily obtainable through interlibrary loan. The library also has subscriptions to 115 full text online publications in the mathematical sciences, plus access to citation/abstract information in MathSciNet (1799 journals), Dissertation Abstracts, and other research databases. The library tracks periodical and research database usage and subscribes to titles most in demand.

These and additional resources are available through a variety of means: the South Dakota Library Network (SDLN), EBSCO Academic Search Premier, ProQuest Research Library, OCLC FirstSearch, the Internet, and the various indexes accessed by the Mundt Library. In short, there is little the library cannot acquire to fill student or faculty needs.

Computer Infrastructure
Within the unit of Computing Services, the Network Services group is responsible for planning, implementing, and securing network services for campus computing resources. A variety of servers in the Server Room provides applications hosting home directories, web space, e-mail, and other central applications. The use of the VM server allows students to access Stella and Maple through the internet.

Working in partnership with the colleges and the institution's academic support areas, Network services develops the image of applications installed on student tablets. Network Services operate a Repair Center, staffed primarily by students, to quickly respond to any computing or network access problems in campus offices or computing laboratories or with students tablet pc's.

Advisory and Support Staff
David Kenley, Dean of Arts and Sciences
Jeffrey Palmer, Mathematics Coordinator
Mary Francis, Director of the Library

Sarah Rasmussen, Director of Online Education
Pam Lewis, Administrative Assistant for the College of Arts and Sciences
Shawn Jaacks, Chief Information Officer

Financial Support
Funds from the Operating Budget of the College of Arts & Sciences are used to support the Mathematics Program, for general operating expenses of the Science Center, and for support of instruction including printing, and office supplies. Additionally, faculty may apply for funds from the College Profession Development Fund to travel to conferences, engage in in-service training, or otherwise support their research/scholarly activities. This fund was formerly held in the Office of the Provost but is now a part of the individual College budgets. The Mathematics Program at DSU has consistently received support from the College budget to maintain a Departmental MAA Membership, for a print subscription to Math Horizons for students, and for occasional books to support teaching and classroom instruction.

Available Budget for Math Program 2016-2023

	Operating Budget	Professional Development
FY23	$58,791	$21,750
FY22	$58,791	$21,750
FY21	$58,791	$21,750
FY20	$58,791	
FY19	$60,385	
FY18	$60,385	
FY17	$60,955	
FY16	$60,600	

Major Financial Concerns
It is expected that support of the College of Arts and Sciences, and therefore of the Mathematics Program, will continue at current levels. We have the resources that we have requested, including the site license for the most current version of Mathematica. Currently, there are no concerns in this regard.

Part 7 - Facilities and Equipment

Current Facilities
All math faculty offices and classes are offered in the Habeger Science Center. The building contains three lecture-style classrooms (two with a capacity of 36 students and one with a capacity of 28 students), two seminar rooms, a 111-seat auditorium, two chemistry laboratories, one physics lecture/lab room, and three biology laboratories.

Quality of the Facilities
The Science Center was renovated in 2009-2010. Consequently, the laboratories, classrooms and offices are well maintained and serviceable.

Additional Facilities Needed
No additional facilities are needed at this time.

Quality of Current Equipment
Faculty at Dakota State University receive a new computer with a memory upgrade on a regular basis. The equipment and software used by the faculty is up-to-date.

Additional Equipment Needed
At this time, we have all the equipment and software we have requested and need for the delivery of our program.

Part 8 - Assessment and Use of Results

Brief History
Assessment of program quality and student outcomes is an important component of program enhancement in the Mathematics Program at Dakota State University. The faculty in this program had developed assessment plans which included student learning outcomes evaluated by multiple measures. At the time of the previous Program Review (2014), this plan had been in place for almost 20 years and included a common set of assessment measures including the following direct and indirect measures: standardized exams, course grades, placement statistics, graduate surveys, and employer surveys.

Changes in staffing, focus, and direction of the Assessment Office on campus (now known as the Office of Institutional Effectiveness, Assessment and Policy) necessitated a change in the assessment process. This was further warranted following the curriculum changes which rolled together the previous math degrees in Information Systems and in Secondary Education as well as the creation of the Cryptography and Intermediate Education Specializations. Below are the four current DSU mathematics programs (one bachelor's program and three certificates) that are part of the institution's academic program assessment plan:
1. Mathematics BS
2. Mathematical Foundations of Cryptography Certificate (Undergraduate)
3. Advanced Mathematics Graduate Certificate
4. Mathematics Graduate Certificate

The Mathematics Program monitors students' academic progress in a variety of ways:
- Upon entry into the University (Placement) Incoming students are evaluated using multiple measures (see https://dsu.edu/student-life/files/course_placement_information__april_2021.pdf) to place them into the appropriate entry-level courses.
- Through General Education Assessment. General Education courses have an assessment plan, and faculty report results each semester in the Trojan Assessment Profile. Math faculty regularly review these data, and the university Academic Assessment Committee reviews results to see if any changes are warranted.

- Through student proficiency in mathematics program learning outcomes (PLOs).
- During the semester in which they graduate (major-field assessment).

Mathematics Program Learning Outcomes (PLOs)

Consequently, in the Spring of 2021 the mathematics faculty engaged in a semester-long discussion of new Program Learning Outcomes (see below), curriculum mapping, and a new assessment process for each mathematics program: .

- Mapped each Program Learning Outcome to courses in which they were introduced, developed, and mastered.
- Established a schedule to monitor each of these outcomes in those courses corresponding to mastery of the outcomes.
- Collected these data for 3 semesters now (see below), and results do not indicate any cause for concern at this time. Faculty do, however, continue to annually review assessment data and recommend changes for improvement, if necessary.

Mathematics BS Program PLO Results 2021-2022

1. Students will demonstrate knowledge of fundamental skills and concepts of mathematics.
   Results since Fall of 2021: 91 of 108 students (84%) evaluated as Proficient.
2. Students will apply mathematical skills to the analysis of real-world problems.
   Results since Fall of 2021: 65 of 77 students (84%) evaluated as Proficient.
3. Students will use logical arguments to explore problems and prove conjectures.
   Results since Fall of 2021: 84 of 100 students (84%) evaluated as Proficient.
4. Students will solve mathematical problems with technology tools.
   Results since Fall of 2021: 85 of 96 students (89%) evaluated as Proficient.

Major Field Assessment Exam (MFAT)

All candidates for graduation complete an assessment activity prior to graduation. Since 1998, all Mathematics for Information Systems majors (now Information Systems or Cryptography Specializations) take the Major Field Assessment Exam (MFAT) in Mathematics. Double majors in Computer Science also complete the MFAT in Computer Science. Both are produced by Educational Testing Service. DSU students' average score has remained within one standard deviation of the national user norm. In addition, the majority of the DSU students score at or above the 50th percentile when compared to the user norms. The MFAT in Computer Science provides assessment indicators in three areas: 1) programming fundamentals, 2) computer organization, architecture and operating systems and 3) algorithms, and theory and computational math. The average scores of the DSU students are also within one standard deviation of the user norms on each of the assessment indicators.

Since 2012, 57 students have completed the Major Field Assessment Exam in Mathematics and only 6 have scored lower than 1 standard deviation of the User Norms – in some cases this may even have been due to a lack of effort as there are no consequences to scoring low on this assessment. During the same time, 12 students have scored above 1 standard deviation of the User Norms.

Degrees Awarded

This table includes the number of degrees awarded by academic year.

Table 4: Number of Degrees Awarded by Academic Year

	SU15, FA15 & SP16	SU16, FA16 & SP17	SU17, FA17 & SP18	SU18, FA18 & SP19	SU19, FA19 & SP20	SU20, FA20 & SP21	SU21, FA21 & SP22	**Total Degrees Awarded**
Math for Info. Systems *(now a specialization)*	4	6	5	11	9	9	2	**46**
Mathematics BS						1	3	**4**
Math Education (BSED)	4	2	2	4	4	1	3	**20**
Total Math	**8**	**8**	**7**	**15**	**13**	**11**	**8**	**70**

An academic year is defined as summer, fall, and spring for the purpose of this report.

Persistence

Persistence: The proportion of a student cohort who enrolled for the first time in a given fall semester and then re-enrolled in a subsequent spring semester. The student must be enrolled in at least one DSU class to be considered persisted. For persistence purposes, a specific population is used: first-time, full-time, baccalaureate degree-seeking freshmen. A student may be counted more than once. If the student is a double major, the student will be counted in each major.

Table 5: Persistence Rates for First-time, Full-time, Baccalaureate Degree-seeking Freshmen (Fall 2015 to Fall 2019 Cohorts)

	Fall 2015 Cohort		Fall 2016 Cohort		Fall 2017 Cohort		Fall 2018 Cohort		Fall 2019 Cohort	
	N	% Returned in Spring	N	% Returned in Spring	N	% Returned in Spring	N	% Returned in Spring	N	% Returned in Spring
Math for Information Systems *(now a specialization)*	2	100.00%	0	n/a	1	100.00%	1	100.00%	1	100%
Math Education	5	100.00%	4	100%	3	100.00%	4	75.00%	6	100.00%

N=total number of students

% Returned in Spring = the percentage of students from the cohort who registered for at least on DSU class in the subsequent spring.

Table 6: Persistence Rates for First-time, Full-time, Baccalaureate Degree-seeking Freshmen (Fall 2020 to Fall 2021 Cohorts)

	Fall 2020 Cohort		Fall 2021 Cohort	
	N	% Returned in Spring	N	% Returned in Spring
Mathematics – Cryptography *(now a specialization)*	0	n/a	1	100%

Math - Information Systems *(now a specialization)*	3	66.70%	1	100%
Math – Intermediate Education *(now a specialization)*	1	100%	0	n/a
Math – Secondary Education *(now a specialization)*	4	100%	1	100%

N=total number of students
% Returned in Spring = the percentage of students from the cohort who registered for at least on DSU class in the subsequent spring.

Retention

Retention: The proportion of a student cohort who enrolled for the first time in a given fall semester and then re-enrolled in a subsequent fall semester. The student must be enrolled in at least one DSU class to be considered retained. For retention purposes, a specific population is used: first-time, full-time, baccalaureate degree-seeking freshmen. A student may be counted more than once. If the student is a double major, the student will be counted in each major.

Table 7: Retention Rates for First-time, Full-time, Baccalaureate Degree-seeking Freshmen (Fall 2015 to Fall 2019 Cohorts)

	Fall 2015 Cohort		Fall 2016 Cohort		Fall 2017 Cohort		Fall 2018 Cohort		Fall 2019 Cohort	
	N	% Returned 2nd year	N	% Returned 2nd year	N	% Returned 2nd year	N	% Returned 2nd year	N	% Returned 2nd year
Math for Information Systems *(now a specialization)*	2	100.00%	0	n/a	1	100.00%	1	100.00%	1	0%
Math Education *(now a specialization)*	5	100.00%	4	100%	3	66.67%	4	100.00%	6	50.00%

Table 8: Retention Rates for First-time, Full-time, Baccalaureate Degree-seeking Freshmen (Fall 2019 to Fall 2021 Cohorts)

	Fall 2020 Cohort		Fall 2021 Cohort	
	N	% Returned 2nd year	N	% Returned 2nd year
Math – Cryptography	n/a	n/a	1	100%
Math - Information Systems	3	66.67%	1	0%
Math – Intermediate Education	1	100%	n/a	n/a
Math – Secondary Education	4	100%	1	100%

N=total number of students
% Ret 2nd year = the percentage of students from the cohort who registered for at least on DSU class in the subsequent fall.

Table 9: Graduation Rates for First-time, Full-time, Baccalaureate Degree-seeking Freshmen (Fall 2013 to Fall 2021 Cohorts)

	Fall 2013 Cohort	Fall 2014 Cohort	Fall 2015 Cohort	Fall 2016 Cohort

	N	Graduated within 5 years	Graduated within 6 years	N	Graduated within 5 years	Graduated within 6 years	N	Graduated within 5 years	Graduated within 6 years	N	Graduated within 5 years	Graduated within 6 years
Math for Information Systems *(now a specialization)*	2	0%	0%	0	n/a	n/a	2	100%	100%	0	n/a	n/a
Math Education *(now a specialization)*	9	44%	44%	3	67%	67%	5	80%	80%	4	100%	100%

N=total number of students
% = the percentage of students from the cohort who graduated from DSU with 5 or 6 years with any baccalaureate degree.

Mathematics Program Assessment Needs

There are three areas of assessment need in the Mathematics Program:
1. The first concerns Mathematics Placement. These policies get set at the state level but there does not seem to be an evaluation of the effectiveness of the policy on individual campuses. Currently DSU is involved in a Pilot Project to evaluate the use of ACT score as a placement tool as opposed to High School GPA which tends to be inflated and biased against certain groups of students.
2. A second assessment need discussed by math faculty is the need to determine exactly where our students, particularly those on campus, are fulfilling their math requirements for their degree programs. We suspect, but do not know, that a large contingent of students may be taking certain courses elsewhere. Having access to this information would allow us to better determine why and how this is impacting our program and course offerings on campus.
3. Thirdly, as the Mathematics Program online course offerings have increased dramatically since the last Program Review, there has been little, if any, assessment of the relative effectiveness of online and face-to-face learning in the Mathematics Program.

In addition to the annual faculty review of assessment results, the Dean of the College of Arts is a member of the Assessment Coordinating Committee. As such, the dean represents the math program in summarizing significant findings based on assessment data and proposed program improvements.

Use of Assessment Findings

The monitoring of student progress is a critical component of program assessment and provides the faculty, students, and administrators with vital information about program quality. The curriculum is reviewed on a regular basis and program modifications are submitted to the University's ~~Academic Council and~~ Curriculum Committee. Students' scores on the major field assessment exams are used as another means of evaluating the curriculum.

Other Measures: IDEA End-of-Course Student Ratings of Instruction

All math faculty participate in the South Dakota Board of Regents (SDBOR) end-of-course requirement pursuant to SDBOR Policy 4:13 Faculty Evaluation (https://www.sdbor.edu/policy/documents/4-13.pdf). The SDBOR requires end-of-course surveys to be used as part of the evaluation of faculty members with teaching responsibilities. The Board selects or develops the tool established to a level of nationally accepted confidence. The current SDBOR-selected instrument is the IDEA Student Ratings of Instruction, a tool based on 45 years of research, developed by faculty at Kansas State University during the 1968-1969 academic year and updated over time.

The IDEA provides free technical assistance documents through its website (https://www.ideaedu.org/) and the Anthology Platform (https://www.anthology.com/) that manages administration of the IDEA survey. Documents include the IDEA Papers Series, IDEA Research Digest, and Research & Technical Reports. Within the Anthology Platform, faculty can access case studies, general resources, and reporting videos explaining report information and best practice webinars on topics such as response rates and faculty development.

Through DSU's Center for Teaching and Learning (CTL), the Office of Institutional Effectiveness, Assessment, and Policy provides annual training to new faculty that focuses their responsibilities with regard to end-of-course surveys, what the IDEA is and is not, selection of IDEA objectives, strategies to improve response rates, and access to IDEA and Anthology resources.

Math faculty have access to their online end-of-course survey results through the Anthology platform after the grades-are-due date at the end of summer, fall, and spring semesters. Faculty can review average adjusted or raw average course scores compared against results in three categories: 1) IDEA Database, 2) IDEA Discipline, and 3) Dakota State University in five performance buckets: Much Lower, Lower, Similar, Higher, and Much Higher. Faculty can also review student comments for these two DSU-added items:
- What is the most important thing your instructor does in this class that helps you learn?
- What is the most important change/adjustment your instructor can make in this class to improve your learning?

Part 9 - Dakota State University's Strategic Plan ADVANCE 2022-2027

Dakota State University's ADVANCE strategic plan began in 2022 and will continue to evolve through 2027 and beyond. Below are selected institutional strategic plan goals (from the larger plan) relevant to the math program:

Pillar 1: Increase student success.
- Goal: Meet or exceed national norms and internal benchmarks for student academic success.
  - Benchmarks:
    - By 2027 the 4-year overall graduation rate for 1st-time, full-time degree-seeking graduates is 40%.

- By 2027 the 6-year overall graduation rate for 1st-time, full-time degree-seeking graduates is 60%.
  - By 2027 the overall retention rate from fall to fall for 1st-time, full-time freshmen degree-seeking graduates is 80%.
  - By 2027 the overall employment rate for 1st-time, full-time degree-seeking undergraduates accounted for is 100%.

Pillar 2: Improve Engagement, Governance, & Communication
- Goal: Increase employees' sense of engagement with the university.
  - Benchmark:
    - By June 30th, 2027, the Gallup Index shows that 50% of DSU employees are engaged (feel involved in and enthusiastic about their work and workplace; they are loyal and productive).

Pillar 3: Grow Scholarship, Research, Intellectual Property, & Economic Development
- Goal: Increase the productivity of research and scholarly activities.
  - Benchmarks:
    - By June 2027, DSU has had 10 or more collaborative research partners in the last five years.
    - By June 2027, sponsored research has $12,000,000 in annual expenditures.
    - By June 2027, Research and Economic Development has generated 10 new research jobs since 2022.
    - From 2022-2027, faculty participating in sponsored programming for the first time increased by 50%.
    - From 2022-2027, the number of staff participating in sponsored programming increases by 25%.
    - From 2022-2027, the number of students participating in sponsored programming increases by 25%.

Pillar 4: Elevate Athletics
- Goal: Elevate the importance of academic success of student athletes through the delivery of student academic supports.
  - Benchmark:
    - By fall 2027, the DSU athlete average GPA is 3.0.

Pillar 5: Increase Sustainability & Resilience
- Goal: Increase Beacom College's capacity to graduate more students each year in targeted computer and cyber sciences programs.
  - Benchmarks:
    - By 2027, the number of unduplicated graduates in computer science, cyber operations, and artificial intelligence at the BS, MS, and PhD levels will increase 10% of the baseline annually to 291 graduates.
- Goal: Increase university enrollment through program development, targeted recruitment, admission, and marketing campaigns.
  - Benchmark:
    - DSU enrollment will exceed 3,700 total students.

Appendix A – Mathematics, B.S. Degree Requirements

https://catalog.dsu.edu/preview_program.php?catoid=35&poid=2676&returnto=1625

Appendix B – Faculty Vitas

Dr. Jeffrey S. Palmer
Professor of Mathematics

ACADEMIC DEGREES
>Washington State University; Pullman, Washington
>>Ph.D. in Mathematics, May 1990
>>M.S. in Mathematics, August 1987
>>Graduate Study in Genetics and Cell Biology, 7/84-5/85
>Bemidji State University; Bemidji, Minnesota
>>Graduate Study in Mathematics, 9/83-5/84
>>B.S. in Biology, May 1984
>>B.A. in Mathematics, Summa Cum Laude, May 1983

PROFESSIONAL EXPERIENCE
>Professor of Mathematics 8/03-present
>>College of Arts & Sciences; Dakota State University
>Associate Professor of Mathematics 8/97-8/03
>>College of Natural Sciences; Dakota State University
>Assistant Professor of Mathematics 8/91-8/97
>>College of Natural Sciences; Dakota State University
>Visiting Assistant Professor 6/96
>>Department of Plant Breeding & Biometry; Cornell University
>Postdoctoral Research Associate 6/90-6/91
>>Department of Plant Breeding & Biometry; Cornell University

CURRENT PROFESSIONAL AND ACADEMIC ASSOCIATION MEMBERSHIPS
>South Dakota Ornithologists' Union, South Dakota Academy of Science

SELECTED PUBLICATIONS
>R.G. Amirkhiz, M.D. Dixon, J.S. Palmer, and D.L. Swanson. 2021. Investigating niches and distribution of a rare species in a hierarchical framework: Virginia's Warbler (Leiothlypis virginiae) at its northeastern range limit. *Landscape Ecology, 23 February 2021*.
>D.L. Swanson, M.D. Dixon, and J.S. Palmer. 2016. A reassessment of the distribution of Virginia's Warbler in the Black Hills of South Dakota. *Western Birds* 47: 214-226.
>J.S. Palmer and Javed, J. 2014. An age-structured model for the American Dipper in the Black Hills of South Dakota. *Proceedings of the South Dakota Academy of Science* 93: 79-88.
>D.L. Swanson and J.S. Palmer. 2009. Spring migration phenology of birds in the northern prairie region is correlated with local climate change. *Journal of Field Ornithology* 80(4): 351-363.

SELECTED PROFESSIONAL PRESENTATIONS

"A reassessment of Virginia's Warbler distribution in the Black Hills of South Dakota" at the South Dakota Ornithologists' Union Fall Meeting and Paper Session; Brookings, SD; 13-15 Nov 2015.

"An Age-structured Population Model for the American Dipper in the Black Hills"; South Dakota Academy of Science Annual Meeting; Rapid City, South Dakota; 28-29 March 2014.

"A Review of the Status and Distribution of the Virginia's Warbler in the Black Hills"; South Dakota Ornithologists' Union Fall Meeting and Paper Session; Brookings, South Dakota; 7-9 October 2011.

"Christmas Bird Count Trends in North and South Dakota"; Climate Change Symposium at the South Dakota Academy of Science Annual Meeting; Oacoma, South Dakota; 8-9 April 2011.

SELECTED GRANTS AND AWARDS

Principle Investigator - State Wildlife Grant T-69-R-1, Study 2480, administered through the U.S. Fish and Wildlife Service and provided by the South Dakota Department of Game, Fish and Parks to upgrade and enhance the Online Seasonal Bird Observation Report System. 2015-2017.

Co-PI on funded grant from the Wildlife Diversity Small Grants Program of SDGF&P to reassess the distribution and abundance of the Virginia's Warbler population in the Black Hills of South Dakota. 2015.

Co-PI and Workshop Facilitator for South Dakota Counts in the Middle – Best Practices in Teaching Mathematics and the New Common Core Standards - funded by No Child Left Behind Act, Title II-A. 2014.

Co-PI for South Dakota Counts in the Middle – Best Practices in Teaching Mathematics and the New Common Core Standards - funded by No Child Left Behind Act, Title II-A. 2013.

Co-PI for South Dakota Counts in the Middle – Best Practices in Teaching Mathematics and the New Common Core Standards - funded by No Child Left Behind Act, Title II-A. 2012.

Co-PI for South Dakota Counts in the Middle funded by No Child Left Behind Act, Title II-A. 2011.

Co-PI for South Dakota Counts in the Middle funded by No Child Left Behind Act, Title II-A. 2010.

RICHARD I. AVERY

College of Arts and Sciences, Dakota State University

EDUCATION:

Doctor of Philosophy in Mathematics
December 1997, University of Nebraska-Lincoln
Research Area: Difference Equations (Boundary Value Problems)
Advisor: Professor Allan Peterson

Master of Science in Mathematics
May 1996, University of Nebraska-Lincoln

Master of Arts in Teaching Secondary Education
May 1992, University of New Hampshire

Bachelor of Science in Mathematics Education, Magna Cum Laude
May 1991, University of New Hampshire

TEACHING EXPERIENCE:

Fall 2008 to present
Professor of Mathematics
College of Arts and Sciences, Dakota State University

Fall 2003 to Summer 2008
Associate Professor of Mathematics
College of Arts and Sciences, Dakota State University

Fall 1998 to Summer 2003
Assistant Professor of Mathematics
College of Natural Sciences, Dakota State University

Fall 1997 to Spring 1998
Visiting Assistant Professor of Mathematics
Department of Mathematics and Statistics, Utah State University

Fall 1994 to Summer 1997
Graduate Teaching Assistant
Department of Mathematics and Statistics, University of Nebraska-Lincoln

Fall 1993 to Spring 1994
International Baccalaureate Mathematics Teacher
St. John's School, Tumon Bay, Guam

PUBLISHED RESEARCH PAPERS IN REFEREED JOURNALS:
Below are some recent publications, see Google Scholar for a more complete list:
https://scholar.google.com/citations?user=TiuZquUAAAAJ&hl=en&scioq=Richard+Avery&oi=sra.

Utilizing an Integrating Factor to Convert a Right Focal Boundary Value Problem to a Fixed Point Problem, Differential Equations & Applications, Volume 14 (2022), Number 2, 179-197 (with D. Anderson).

Mathematical Analysis in Interdisciplinary Research, Springer Optimization and Its Applications, Volume 179, I.N. Parasidis et al. (eds.), Springer, 2021, Chapter 7. Using an Integrating Factor to Transform a Second Order BVP to a Fixed Point Problem, 101-108 (with D. Anderson, J. Henderson).

Alternative Fixed Point Method, International Journal of Difference Equations, ISSN 0973-6069, Volume 15 (2020), Number 2, 301-308.

Layered Monotonic Fixed Point Theorem, Results in Fixed Point Theory and Applications, Volume 2020, Article ID 2018037, 10 pages, eISSN 281-6047 (with D. Anderson and J. Henderson).

Alternative Iterative Technique, Electronic Journal of Qualitative Theory of Differential Equations, 2019, Number 51, 1-7; http://www.math.u-szeged.hu/ejqtde/, (with D. Anderson and J. Henderson).

Applications of Nonlinear Analysis, Springer Optimization and Its Applications, Volume 134, Themistocles M. Rassias Editor, Springer, 2018, Chapter 2. Criteria for Convergence of Iterates in a Compression-Expansion Fixed Point Theorem of Functional Type, 21-35 (with D. Anderson, J. Henderson).

EDITORIAL BOARDS:

Journal of Function Spaces
Mathematical Problems in Engineering
Journal of Fixed Point Theory

GRANTS FUNDED:

Mathematics and Technology,
Title II Part-A No Child Left Behind Improving Teacher Quality Program (2004).

Math and Science Inquiry Based Labs,
Title II Part-A No Child Left Behind Improving Teacher Quality Program (2005).

Computer Assisted Mathematics Instruction,
Title II Part-A No Child Left Behind Improving Teacher Quality Program (2006).

Interdisciplinary Approaches to Teaching Inquiry Based Science,
Title II Part-A No Child Left Behind Improving Teacher Quality Program (2007).

Mark Spanier

Contact Information
The Beacom College of Computer and Cyber Sciences,
Dakota State University
820 N. Washington Ave.
Madison, SD 57042-1799

Email: mark.spanier@dsu.edu
Voice: 320.493.8660

Education
Ph.D., Mathematics (2015)
      North Dakota State University
      Advisor: Dr. Friedrich Littmann
      Dissertation: L1 Approximation in de Branges Spaces

College Teaching Certificate (2015)
      North Dakota State University
      Emphasis: STEM Education

B.S., Mathematics (2010)
      North Dakota State University
      Thesis Advisor: Dr. Marian Bocea
      Thesis: A Formal Derivation of the Aronsson Equations for Symmetrized Gradients

Research Interests
Approximation Theory, Cryptography, Security and Artificial Intelligence, Signal Processing, Analytic Number Theory, Computational Number Theory, Harmonic Analysis, Optimization Theory

Employment
      2022 – Present: Associate Professor, Dakota State University
      2017—2022: Assistant Professor, Dakota State University
      2015 – 2017: Instructor, Dakota State University
      2014—2015: Mathematics Department Teaching Fellow, North Dakota State University
      2014 – 2015: Curriculum Consultant, West Fargo Public School District
      2013 – 2014: College of Science and Mathematics Research Fellow, North Dakota State University
      2012 – 2014: GraSUS K-12 Teaching Fellow, West Fargo Public School District
      2011 – 2012: GraSUS K-12 Teaching Fellow, Fargo Public School District
      2011 – 2014: Graduate Mathematics Instructor, North Dakota State University
      2010: Teaching Assistant, Carnegie Mellon University
      2007 – 2010: Teaching Assistant, North Dakota State University

Publications - Appeared/Accepted
1. Weighted Uniform Convergence of Entire Grunwald Operators on the Real Line. Comput. Methods Funct. Theory (2021). https://doi.org/10.1007/s40315-021-00408-2
2. Extremal Signatures, with F. Littmann, Constr. Approx. 47, no. 2 (2018), 339–356. https://doi.org/10.1007/s00365-017-9373-7
3. Extremal Functions with Vanishing Condition, with F. Littmann, Constr. Approx. 42, no. 2 (2015), 209–229. https://doi.org/10.1007/s00365-015-9304-4
4. L1 Approximation in de Branges Spaces, Ph.D. Dissertation, North Dakota State University, 2015.
5. The Geometry of Tetris, with L. Mitzel, The Mathematics Teacher, 108, no. 1 (2014), 58–63.
6. A Formal Derivation of the Aronsson Equations for Symmetrized Gradients. Siuro, 3, no. 1 (2010), 112–119.

Publications - Submitted
1. Detection and Prevention Against Poisoning Attacks in Federated Learning, with V. Valadi, M. Englund, and A. O'Brien, preprint at arXiv:2210.14944

Publications - In Preparation
1. Residuals and Sign Changes of Extremal Signatures
2. Extremal Functions in de Branges Spaces – Poisson and Conjugate Poisson Kernels

Grant Activity
1. SD CyberNET CTE (2021-2022) – CoPI $50,000
2. NSA EPNC/EPI (2022-2024) – PI $125,000

Undergraduate Students (Formal Research Projects)
1. Emily Ortmann
   B.S. Mathematics for Information Systems and Computer Science – Fall 2018
   Honors Thesis: Simulations and Queueing Theory: The Effects of Randomly Bypassing Security
   2nd place at DSU's 2018 Research Symposium Poster Session (with Laura Schuck)
2. Laura Schuck
   B.S. Mathematics for Information Systems and Computer Science – Fall 2018
   Honors Thesis: Simulations and Queueing Theory: The Effects of Priority and VIP Thresholds
   2nd place at DSU's 2018 Research Symposium Poster Session (with Emily Ortmann)
3. Madison Krell
   B.S. Mathematics and Computer Science – Fall 2020
   Research Project (2019): Mastermind with a Deceptive Code-Maker 3rd place at DSU's 2019 Research Symposium Poster Session
4. Alexis VanderWilt
   B.S. Mathematics and Computer Science – Spring 2020

Research Project (2019): Impact of Social Networks on the Spread of Disease Research
Project (2020): Effects of 'Super Territories' on Population Dynamics Co-advisor: Dr.
Jeffery Palmer
1st place at DSU's 2019 Research Symposium Poster Session
5. Aaron Oakland
B.S. Mathematics for Information Systems and Computer Science – Fall 2020 Research
Project (2020): Sieving and Factorization Algorithms/Implementations
6. Jaron Burnett and Aaron Steele
B.S. Computer Science – Fall 2020
Research Project (2020): Computational Graph Theory Algorithms/Implementations

Graduate Students (Formal Research Projects)
1. Chinyere Isaac-Heslop
Ph.D. Cyber Operations – Expected Spring 2023
Dissertation: Potential Pre/Post Quantum Cryptography Mirror: Does Added Complexity
Diminish Security?
2. Madeleine Englund, Nikolaos Kakouros, Jason Mixon, Charles Novak, Viktor Valadi
DSU/AI Sweden Industrial Immersion Project Advisor
Research Project (2022): Detection and Prevention Against Poisoning Attacks in
Federated Learning

GenCyber Summer Camps
CoEd 9-12 Camp Instructor: Su19, Su21, Su22
Teacher's Camp Instructor: Su19, Su21, Su22

Courses taught at Dakota State University
CSC 792: ST: Artificial Intelligence Research - Su22
CSC 591: IS: Computational Graph Theory - Su20
CSC 404: Foundations of Computation - S20 (x2), S21 (x2), S22 (x3), S23 (x3)
CSC 404: Foundations of Computation (Online) - S20, S21 (x2), Su21, S22 (x2), Su22, S23
(x2)
CSC (4|5)02: Math Foundations of Artificial Intelligence - F20, F21, F22
CSC (4|5)02: Math Foundations of Artificial Intelligence (Online) - F20, F21, F22
Math 492: Signals and Systems - F19
Math 491: IS: Cryptography and Codes II - F20
Math 491: IS: Queueing Theory - S18
Math 488: Math Capstone - F17, F18
Math 475: Operations Research - F17
Math 475: Operations Research (Online) - F17
Math (4|5)37: Cryptography and Codes - F19, F20, F21, F22
Math (4|5)37: Cryptography and Codes (Online) - F19, F20, F21, F22
Math (4|5)36: Number Theory and Cryptography - S19, S20, S21, S22, S23
Math (4|5)36: Number Theory and Cryptography (Online) - S19, S20, S21, S22, S23
Math 201: Intro to Discrete Math - S17, F17, S18, F18 (x2), F19, F20, S21, F21, F22

Math 201: Intro to Discrete Math (Online) - Su17, F17, S18 (x2), Su18, F18 (x2), Su19, F19,
S20 (x2), Su20, F20, Su21
Math 123: Calculus I - S17, S18, Su18, S19, Su19
Math 123: Calculus I (Online) - S17, Su17, S18, Su18, S19, Su19, Su20, Su21
Math 120: Trigonometry - F15, S16, F16, F17, F18
Math 120: Trigonometry (Online) - S16, Su16, Su17, Su18, Su19
Math 104: Finite Mathematics - F16
Math 102: College Algebra - F15 (x3), S16 (x2), F16 (x3)
Math 095: Pre-College Algebra - F15, S16, F16

Courses taught at North Dakota State University
Math 790: Graduate Analysis Seminar 'Analysis Preliminary Exam Bootcamp' - Su11
Math 265: Calculus III - Su12
Math 259: Multivariate Calculus - Su12
Math 144: Mathematics for Business - Su15
Math 129: Basic Linear Algebra - F14 (x2)
Math 128: Introductory Linear Algebra - F14, S15
Math 104: Finite Mathematics - S15
Math 103: College Algebra - Su14
Math 102: Intermediate Algebra - Su13

Courses assisted as K-12 Teaching Fellow in West Fargo Public School District
Algebra II: F12, S13, F13, S14
Geometry: F12, S13, F13, S14
Algebra I: F12, S13, F13, S14
Math 8: F12, S13, F13, S14
Math 7: F12, S13, F13, S14
Math 6: F13, S14

Courses assisted as K-12 Teaching Fellow in Fargo Public School District
Algebra II: F11, S12
Geometry: F11, S12

Recitations taught as Teaching Assistant at Carnegie Mellon University
Math 21-259: Calculus in 3D - F10 (x2)

Recitations taught as Teaching Assistant at North Dakota State University
Math 265: Calculus III - F09 (x2), S10 (x2)
Math 259: Multivariate Calculus - S11 (x2)
Math 165: Calculus I - S09 (x2)
Math 166: Calculus II - F08 (x2)
Math 146: Applied Calculus - F07
Math 105: Trigonometry - S08 (x2)

Math 103: College Algebra - F07

Conference and Seminar Talks
2022:

Wordle – A MinMax Approach, NESeSD MAA Spring Sectional Meetings, Dakota State University, Madison, SD

2019:

Cryptography and Codes, Sioux Falls STEM Circle, Augustana University, SD
Mastermind with a Deceptive Code-Maker, NESeSD MAA Spring Sectional Meetings, College of Saint Mary, Omaha, NE
Attacks on Cryptosystems, DSU Offensive Network Security (Computer Club), DSU

2018:

I Prefer Pi: Mathematical Palindromes, DSU Undergraduate Math Seminar Series, DSU
PRIMES: I have the biggest and best primes. (These primes are going to be Yuge), DSU Undergraduate Math Seminar Series, DSU
Mathematics of the card game SET, DSU Undergraduate Math Seminar Series, DSU

2015:

Extremal Signatures and Best $L1(\mu)$-Approximations, AMS-MAA Joint Mathematics Meetings, San Antonio, TX

2014:

Interpolations at Zeros of Laguerre-Polya Functions and L1-approximations, Analysis Seminar, North Dakota State University, Fargo, ND
Beurling-Selberg Extremal Problems in de Branges Spaces, AMS-MAA Joint Mathematics Meetings, Baltimore, MD

2013:

The Beurling-Selberg Extremal Problem and Applications, Graduate Colloquium, North Dakota State University, Fargo, ND
The Mathematics of Mastermind, Sonia Kovalevsky Mathematics High School Day, North Dakota State University, Fargo, ND

2012:

The Geometry of Tetris, Sonia Kovalevsky Mathematics High School Day, North Dakota State University, Fargo, ND

2011:

Some Interesting sinc Integrals, Graduate Colloquium, North Dakota State University, Fargo, ND

2010:

The Aronsson Equations for Symmetrized Gradients, Mathematics on the Northern Plains, Morningside College, Sioux City, IA

2009:

The Aronsson Equations for Symmetrized Gradients, Senior Seminar, North Dakota State University, Fargo, ND
Preference Relations and Utility Functions, Center for Nonlinear Analysis Summer Institute, Carnegie Mellon University, Pittsburgh, PA

Algorithms and Applications for Discrete Ricci Flow, Center for Nonlinear Analysis Summer Institute, Carnegie Mellon University, Pittsburgh, PA

2008:

Priority Queue Simulations, Center for Nonlinear Analysis Summer Institute, Carnegie Mellon University, Pittsburgh, PA

Refereeing

Manning Publications, Communications on Applied Nonlinear Analysis (CANA), Journal of Function Spaces

Professional Organization

MAA: Mathematical Association of America

2022 – Present: Communication Co-Officer (Nebraska/SE South Dakota Section). Elected position charged with updating section website and sending section information

2021 – 2022: Section Chair (Nebraska/SE South Dakota Section). Elected position charged with hosting, planning, and running the spring sectional meeting.

2019 – 2021: Section Chair Elect (Nebraska/SE South Dakota Section). Elected position charged with assisting the Section Chair to plan and run sectional meeting.

SINE COMMIT: South Dakota, Iowa, and NEbraska (SINE) COMmunity for Mathematics (COMMIT)

2022 – Present: Communication Officer. Elected position charged with updating section web- site and sending section information

2021 – Present: Leader. Elected position charged with planning and developing SINE COMMIT events

University Service - Dakota State University

2022 – Present: General Faculty President

2022 – Present: Artificial Intelligence (AI) Club Advisor

2019 – Present: Honors Committee

2019 – Present: Gaming Club Advisor

2019 – Present: Title IX Investigator

2018 – Present: Faculty Development Committee

2022: Assistant Professor of Mathematics Assistant Professor(s) of Computer Science (AI Focused)

2022: Faculty Search Committee - Assistant Professor of Mathematics

2021: Faculty Search Committee - Assistant Professor(s) of Computer Science

2021: Faculty Search Committee - Instructor(s) of Computer Science

2021: Faculty Search Committee - Assistant Professor of Mathematics\

2020: Faculty Search Committee - Assistant Professor(s) of Computer Science

2020: Faculty Search Committee - Instructor(s) of Computer Science

2016 – 2020: Student Success Committee

2019 – 2020: Faculty Game Producer – Expedition

2018 – 2020: Organizer for Mathematics Seminar and Speaker Series

     2018 – 2019: Faculty Game Producer - Kingdom Cleanup
     2017 – 2019: Curriculum Committee
     2019: Faculty Search Committee - Assistant Professor of Mathematics
     2018: Quality Assurance (Online) Reviewer
     2018: Faculty Search Committee - Visiting Assistant Professor of Biology
     2018: General Education Math Summit
     2017: Faculty Search Committee - Assistant Professor of Mathematics

University Service - North Dakota State University
     2015: NDSU Math Fair
     2013 – 2015: NDSU Department of Mathematics Chair's Student Advisory Board
     2014: Sonia Kovalevsky Math Day for Young Women in High School
     2014: Expanding Your Horizons Conference
     2014: Tri-College Mathematics Tournament
     2013: Sonia Kovalevsky Math Day for Young Women in High School
     2013: North Dakota Science Olympiad Co-Facilitator
     2012: NDSU Department of Mathematics Teaching Mentor
     2012: Sonia Kovalevsky Math Day for Young Women in High School
     2011 – 2012: Applied Mathematics Search Committee - Student Member
     2011: Sullivan Middle School Science Fair Judge
     2007 – 2010: NDSU College of Science and Mathematics Ambassador
          President: 2007–2008
          Congress of Student Organizations Officer: 2007
     2007 – 2015: NDSU Mathematics Club Math-In

Curriculum Vitae

Contact Information

Richard Wicklein, Ph.D.

Dakota State University
820 N. Washington Ave.
Madison, SD 57042

E-Mail: richard.wicklein@dsu.edu
Cell Phone: (847) 404-2471
Office Phone: (605) 679-7663

Education

Ph.D. in Mathematics
North Dakota State University, August 2013
Advisor: Sean Sather-Wagstaff
Codualizing Modules And Complexes

B.S. in Mathematics-Education and Secondary Education
Mount Mercy College, Cedar Rapids, IA, May 2006

Employment

- Assistant Professor of Mathematics, Dakota State University, Fall 2017 to Present
- Assistant Professor of Mathematics, MacMurray College, Fall 2014 to Fall 2017
- Visiting Instructor, Morningside College, Fall 2013 to Fall 2014
- Graduate Teaching Fellow, North Dakota State University, Fall 2010 to Summer 2013
- Graduate Teaching Assistant, North Dakota State University, Fall 2007 to Fall 2010

Research Interests

Commutative algebra, homological algebra, combinatorial games

Refereed Publications

1. *Extended local cohomology and local homology*, with S. Sather-Wagstaff, Algebr. Represent. Theory, 19,(2016), no5, 1217-1238.
2. *Support and adic finiteness for complexes*, with S. Sather-Wagstff, Comm. Algebra, 45, (2017), no 6, 2569-2592.
3. *Adic finiteness: bounding homology and applications*, with S. Sather-Wagstaff, Comm. Algebra, 45, (2017), no 9, 3893-3916.
4. *Adically finite chain complexes*, with S. Sather-Wagstaff, J. Algebra Appl. 16, (2017), no 12, 23 pp.
5. *Adic Foxby classes*, with S. Sather-Wagstaff, Algebr. Represent. Theory, 24, (2021), 1155-1189.
6. *Adic semidualizing complexes*, with S. Sather-Wagstaff, J. Algebra Appl. 21 (2022), no. 5, 27pp.

Teaching Experience

Dakota State University, Madison, SD
- College Algebra
- Trigonometry (on campus and online)
- Calculus I (on campus and online)
- Calculus II (online)
- Introduction to Discrete Math (on campus and online)
- Introduction to Statistics
- Linear Algebra (on campus and online)
- Discrete Mathematics (on campus and online)
- Introduction to Probability and Statistics (on campus and online)

MacMurray College, Jacksonville, IL
- Developmental Mathematics
- Mathematics for the Liberal Arts (on campus and online)
- Quantitative Reasoning
- College Algebra and Trigonometry
- Calculus I
- Calculus II
- Statistics II

Morningside College, Sioux City, IA
- Mathematical Understanding and Reasoning (Math for the liberal arts)
- Precalculus
- Calculus II
- Modern Algebra I
- Co-director of undergraduate research groups in Cops and Robbers and Nim on graphs

North Dakota State (NDSU), Fargo, ND
- College Algebra

- Finite Mathematics
- Introduction to Linear Algebra
- Basic Linear Algebra
- Calculus I
- Calculus II
- Differential Equations

Conference Talks and Presentations

1. *Codualizing Complexes And Their Auslander And Bass Classes*. Twenty-minute talk at the American Mathematical Society (AMS) Joint Meetings in Baltimore, MD January 2014
2. *Codualizing Complexes*. Twenty-minute talk at the American Mathematical Society (AMS) sectional meeting in Louisville, KY October 2013
3. *Codualizing Complexes*. Twenty-minute talk at the American Mathematical Society (AMS) sectional meeting in Ames, IA April 2013
4. *Codualizing Modules and Complexes*. Forty-minute talk at the KUMUNU, Jr. in Lincoln, NE April 2013
5. *Codualizing Modules and Complexes*. Poster presentation at Further Connections Between Algebra and Geometry in Fargo, ND February, 2013
6. *Codualizing Modules*. Ten-minute talk at the American Mathematical Society (AMS) Joint Meetings in San Diego, CA January 2013
7. *Codualizing Modules*. Twenty-minute talk at the American Mathematical Society (AMS) sectional meeting in Akron, OH October 2012

Seminar Talks

- Three Talks on David Eisenbud's Paper "Homological Algebra On A Complete Intersection, With An Application To Group Representations" Eisenbud Seminar at NDSU, Fall 2011
- A connection between the Koszul complex and Tor. Algebra and Discrete Math Seminar at NDSU, April 2011

General Audience Talks

- *Weird Dice*, A Little Math Talk given at Dakota State University Spring 2018.
- *Graph Coloring*. Given at MacMurray College. March 2014.
- *Constructible Numbers And Origami*. Given at Morningside College. November 2013.
- *WAR, What Is It Good For? A Look At Sabermetric Baseball Statistics*. Given to the Morningside College Math Club. September 2013.

Other Conferences Attended

- MAA Nebraska-Southeast South Dakota Sectional Meeting in Madison, SD. Spring 2022.
- MAA Nebraska-Southeast South Dakota Sectional Meeting in Omaha, NE. April 2019.

- MAA Iowa Sectional Meeting in Sioux City, IA. October 2018.
- MAA Illinois Sectional Meeting in Jacksonville, IL. April 2016.
- AMS - MAA Joint Meetings in Baltimore, MD. January 2014.
- AMS Central Sectional Meeting in Louisville, KY. October 2013.
- AMS Central Sectional Meeting in Ames, IA. April 2013.
- KUMUNU, Jr. An algebra conference for graduate students and post-docs in Lincoln, NE. April 2013.
- AMS - MAA Joint Meetings in San Diego, CA. January 2013.
- AMS Sectional Meeting in Akron, OH. October 2012.
- KUMUNU, Columbia, MO. September 2012.
- Canadian Mathematical Society (CMS) Summer Meeting, University of Regina, SK. June 2012.
- Workshop on connections between algebra and geometry. University of Regina, SK. May 2012.

Awards

- NDSU Department of Mathematics Graduate Teaching Award. Spring 2011.
- NDSU Department of Mathematics Graduate Research Award. Spring 2013.

University Services

Dakota State University
- Dakota State University College of Arts and Sciences representative to Curriculum Committee. Fall 2019 to present.
- Dakota State University representative to Math Discipline Council to the SDBOR. Fall 2022 to present.
- Dakota State University assessment coordinator for the math program. Fall 2020 to present.
- Dakota State University College of Arts and Sciences representative to University Research Committee. 2018-2019 academic year.

MacMurray College
- General Education Committee: wrote and implemented goals, outcomes, and mission statement of the quantitative reasoning portion of the general education curriculum. Fall 2014 to Spring 2017.
- Faculty representative to the Board of Trustees Institutional Advancement Committee. 2016-2017 academic year.
- Honorary Degree Candidate committee. 2016-2017 academic year.
- Higher Learning Commission (HLC) Assurance Argument Committee. 2016-2017 academic year
- Search committee for microbiology and cellular biology position. Spring 2017.

North Dakota State University
- Committee member for textbook review of Math 128/129: Introduction to Linear Algebra/ Basic Linear Algebra at NDSU
- Committee member for hiring open lecturer position in mathematics at North Dakota State University

Hannah Altmann
Curriculum Vitae

College of Arts and Sciences
Dakota State University
146C Habeger Science Center
820 N Washington Ave
Madison, SD 57042

hannah.altmann@dsu.edu
605-681-6804

Education

August 2015	**Ph.D in Mathematics, North Dakota State University** Advisor: Keri Sather-Wagstaff Dissertation Title: Semidualizing DG Modules over Tensor Products.
May 2009	BS in Mathematics Education, Minnesota State University Moorhead

Employment

2019-present	Assistant Professor of Mathematics, Dakota State University
2017-2019	Two Year Fixed-Term Assistant Professor, Bemidji State University
2015-2017	Visiting Assistant Professor, University of Minnesota, Morris
2014-2015	ND EPSCoR Doctoral Dissertation Assistantship
2012-2014	NDSU Graduate Teaching Fellow
2009-2012	NDSU Graduate Teaching Assistant

Research Interests

Commutative Algebra
Homological Algebra
Semidualizing Modules and Complexes
Perfect Complexes

Refereed Research Publications

Semidualizing DG modules over tensor products, Journal of Algebra and its Applications **15**, (2016), no. 6, 17 pp
Lower bounds on projective levels of complexes, with E. Grifo, J. Montaño, W. Sanders, and T. Vu, Journal of Algebra **491**, (2017), 343-356
On Gerko's Strongly Tor-independent Modules, with K. Sather-Wagstaff, Women in Commutative Algebra, Association for Women in Mathematics Series **29**, (2022), 1-10

Memberships

American Mathematical Society

Awards

| | NDSU Mathematics Department Teaching Award Spring 2013 |

Courses taught at Dakota State University

Math 114, College Algebra
Math 120, Trigonometry
Math 123, Calculus I
Math 201, Introduction to Discrete Mathematics
Math 225, Calculus III
Math 282, Math of Games
Math 316, Discrete Mathematics
Math 413, Abstract Algebra

Courses taught at Bemidji State University

Math 0800, Intermediate Algebra
Math 1100, Mathematical Reasoning
Math 1170, College Algebra
Math 2210, Discrete Mathematics
Math 2472, Calculus II
Math 3310, Linear Algebra

Courses taught at University of Minnesota, Morris

Math 1012, Precalculus I: Functions
Math 1021, Survey of Calculus
Math 1101, Calculus I
Math 1102, Calculus II
Math 2111, Linear Algebra

Courses taught at NDSU

Instructor	Math 102, Intermediate Algebra
	Math 103, College Algebra
	Math 104, Finite Mathematics
	Math 128, Linear Algebra (8-week)
	Math 129, Linear Algebra
	Math 146, Applied Calculus
	Math 165, Calculus I
TA	Math 103, College Algebra
	Math 105, Trigonometry
	Math 146, Applied Calculus
	Math 165, Calculus I
	Math 166, Calculus II
	Math 265, Calculus III

Conference Talks

Invited	
2013	Special Session on Commutative Rings, Ideals, and Modules, AMS meeting, University of Louisville
2014	Special Session on Homological Methods in Algebra, AMS meeting, Texas Tech University
	Special Session on Commutative Ring Theory, AMS meeting, University of Wisconsin Eau Claire
2015	KUMUNU Jr. Meeting, University of Nebraska Lincoln
	Special Session on Homological Methods in Commutative Algebra, AMS meeting, California State University Fullerton
2016	Special Session on Commutative Algebra (MRC session), Joint Mathematics Meetings, Washington State Convention Center, Seattle Washington
	Special Session on Early Career Female Mathematicians in Algebra and Topology, Joint Mathematics Meetings, Washington State Convention Center, Seattle Washington
	Special Session on Non-Noetherian Commutative rings, AMS meeting, State University of Stony Brook
	Special Session on Homological Methods in Commutative Algebra, AMS meeting, North Carolina State University
2017	Special Session on Commutative Algebra, AMS meeting, Washington State University
2018	Special Session on Commutative Ring Theory, AMS meeting, University of Michigan
2020	Special Session on Homological Commutative Algebra, AMS meeting, University of Tennessee at Chattanooga
2021	Special Session on Commutative Algebra, AMS meeting, Creighton University
Contr. Paper	
2018	Contributed Paper Session, AMS Meeting, Ohio State University

Other Talks

Seminars	
2013	Algebra Seminar, NDSU
2014	Algebra Seminar, NDSU,
	Jr. Algebra Seminar, NDSU
Colloquia	
2013	Jr. Colloquium, NDSU
2017	Graduate Colloquium Series, University of Minnesota, Duluth
Math Club	
2017	Math Club, Bemidji State University

Poster Sessions

2015	Poster presentation during AWM Worshop Reception, Joint Mathematics Meetings, San Antonio, TX
	Poster presentation at ND EPSCoR State Conference, Fargo, ND

Service

NDSU	New faculty search committee member Spring 2011
	Sonia Kovalevsky Day Volunteer Fall 2010, Fall 2013
	Undergraduate Teaching Assistant Mentor Spring 2014
	Assisted with Graduate Student Orientation 2010-2014
	Assisted with the Tri-College Mathematics Contest Spring 2014
	Assisted with Governor School at NDSU Summer 2014
	Helped start Mathematics Graduate Student Organization of NDSU Summer 2014
	Helped organize graduate student recruitment event at NDSU Spring 2015
	Assisted with mentoring undergraduate during their senior research project Spring 2015
UMM	Advised student during their senior seminar research project Fall 2016-Spring 2017
BSU	Student Academic Programs Committee member Fall 2017
	Assisted with Northern Minnesota Mathematics Contest Fall 2017
	Gave talk at Math Club about Graduate School Fall 2017
	Attended a workshop on Recognizing and Preventing Microaggressions Fall 2017
	Helped serve breakfast to undergraduates during Midnight Breakfast Fall 2017
	Became a full graduate faculty member Fall 2017
	Facilitated presentations at the Student Achievement Conference Spring 2018
	Helped with the Academic Advising and Registration Event Spring 2018
	Advisory Committee member for the Department of Mathematics and Computer Science 2018-2019 academic year
DSU	Member of the Academic Advisory Board, three year term starting Fall 2019
	Member of the Code of Conduct Board, three year term starting Fall 2020
	Member of the Scholarship Committee, two year term starting Fall 2022
	Moderated talks at the MAA meeting held Spring 2022
	Member of hiring committee for assistant professor of mathematics searches (each academic year 2019-2023)

Internal Funding

UMM Faculty Research Enhancement Funds for $400 October 2015
UMM Faculty Research Enhancement Funds for $400 January 2016
UMM Faculty Research Enhancement Funds for $400 March 2016
UMM Faculty Research Enhancement Funds for $400 November 2016
BSU Professional Improvement Grant for $931.38 November 2018

External Funding

IBL Communities Mini-Grant for $250 October 2019