COLORADO MESA
UNIVERSITY

Program Review
2014-15 through 2020-21

Mathematics

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1. **Introduction and Program Overview**

    a. **Program description by level**

    We offer several programs in the Department of Mathematics and Statistics. In particular, we offer B.S. degrees in Mathematics, Mathematics with a Concentration in Secondary Education, Mathematics with a Concentration in Statistics, Mathematics with a Concentration in Applied Mathematics (new in 2017) and Mathematics with a Concentration in Actuarial Science (new in 2019). We offer an A.S. degree in Mathematics, a B.A. degree in Elementary Education, Math Emphasis, a Graduate Certificate in Applied Mathematics (new in 2017), and Minors in Mathematics and Statistics. Detailed descriptions of curriculum for each bachelor's degree program can be found in Section 2a of this document and program sheets can be found in Appendix A.

    b. **A brief history of the program**

    The baccalaureate-level Mathematics program has evolved with the institution from a B.S. in Physical Science and Mathematics that required an emphasis in Computer Science, Mathematics, or Computer Science and Applied Mathematics in 1980 to a B.S. in Mathematics with concentrations in mathematics, secondary education, and statistics beginning in 1991. Concentrations in applied mathematics and actuarial science were added to the program in 2017 and 2019, respectively, and a Graduate Certificate in Applied Mathematics was created in 2017.

    In 1993, the institution enacted the graduation requirement legislated by the state of Colorado that every baccalaureate candidate must complete at least one college-level mathematics course and delivery of that coursework became part of the role of the mathematics program as well.

    In 2008, the mathematics program had 14 Tenured/Tenure Track (T/TT) faculty members, 2 full-time Instructors and 6 part-time Lecturers. In 2014, there were 14 T/TT faculty members, 7 full-time Instructors and 10 part-time Lecturers. Currently, the Mathematics program has 13 T/TT faculty members, 13 full-time Instructors including one at the Montrose campus, and 3 part-time Lecturers.

    c. **Recommendations from the previous external review and progress made toward addressing them**

    The external reviewer for our previous Program Review (Fall 2008-Spring 2014) was Dr. Janet Beery, Professor of Mathematics and Computer Science at University of Redlands in Redlands, California. Dr. Beery wrote that we have a "strong, comprehensive program and an energetic thoughtful faculty always looking for ways to improve its curriculum and instruction." She wrote about several of our departmental strengths including robust major, appreciative students and graduates, alignment with the goals for undergraduate majors published in the Mathematical Association of America's CUMP (Curriculum Guide to Majors in the Mathematical Sciences), faculty commitment to student-centered teaching, broad faculty experience and involvement in service and scholarship, as well as

effective advising. Dr. Beery also made recommendations that she thought would further strengthen our programs. Over the past review period we have considered Dr. Beery's recommendations and have made several changes to our program to address those recommendations. We note some of those changes below.

New Courses:

Topics and Careers in Math (MATH 150): In Fall 2016 we began offering Topics and Careers in Math (MATH 150) as a topics course and it became a permanent course in Spring 2018. In this course students are introduced to mathematical thinking through exciting mathematics and statistics topics that they are not likely to have seen in high school such as non-Euclidean geometries, fractals, the Collatz Conjecture, the Monty Hall Problem, data science, and Fourier analysis. Students learn about careers in mathematics and participate in a panel session with CMU mathematics alumni. They learn about the different mathematics concentrations available at CMU and how to navigate scheduling mathematics courses, and they participate in a panel session with current CMU mathematics majors. Students are also introduced to LaTeX, writing mathematics papers, and giving mathematics presentations. This new course addresses recommendations by Dr. Beery that we provide mathematics students with more information about career options earlier in their programs, recruit majors from those students who like mathematics but are not sure about majoring in mathematics, prepare students for papers and presentations in future mathematics courses, and give additional support to students in navigating mathematics course offerings. Topics and Careers in Math (MATH 150) is a required course for all concentrations in the mathematics program.

Senior Capstone (MATH 492): In Fall 2020 we began offering Senior Capstone (MATH 492). This course was designed to replace our Senior Seminar (MATH 484-494) sequence to both streamline the capstone experience and engage math majors in all concentrations, addressing select recommendations of our previous reviewer. Instead of a two-semester sequence (Senior Seminar I, II, each 2 credits), we now have a single course (Senior Capstone, 3 credits) offered each fall. Select topics that had been offered in our previous Senior Seminar sequence (LaTeX, math writing, math presentations, math careers) are included in Topics and Careers in Math (MATH 150). Instead of one large research project, the new course includes two smaller research projects. One project is focused on an ethical or social issue related to mathematics and the other is a larger final research project that is tailored to each student's concentration within the major, conducted under the mentorship of a faculty member, and culminates in a written paper, as well as a poster and oral presentation. The final project is expected to be smaller than the research project of the previous Senior Seminar course sequence (where students had most of a semester to carry out the project) but is still a substantial project that the students work on for eight weeks. Secondary education mathematics students did not take our previous Senior Seminar sequence. However, these students are now required to take Senior Capstone and benefit from researching different methods or aspects of mathematics pedagogy.

Course Revisions:

Mathematical Investigations (MATH 110): Following a period of soliciting input from departments that offer B.A. degrees, our College Mathematics (MATH 110) course was significantly revised. The new course, renamed Mathematical Investigations (MATH 110), is a coordinated course that includes a focus on real-world modeling and projects on topics of relevance to students. An open-source textbook was chosen for the course both for its low cost to students, as well as its content and flexibility. Dr. Tracii Friedman edited and revised much of the text material to match the desired focus for the course. These adjustments are in line with Dr. Beery's recommendation that we integrate more real-world modeling and problem-solving into some of our entry-level courses. A similar process (gathering outside input, selecting a new text, and planning course revisions) is now underway for our College Algebra (MATH 113) course.

Communities of Practice:

To establish an official venue for sharing experiences and materials in order to enhance instruction, a College Algebra (MATH 113) Community of Practice was created in Fall 2019. The group consisted of all faculty members currently teaching the course and met approximately twice per month. Meetings included time for socialization as well as discussing course issues and content questions. Members of the Community of Practice also read and summarized for each other portions of the MAA Instructional Practices Guide and began creating a shared repository of College Algebra (MATH 113) materials to aid instructors in trying alternative activities and to provide new instructors with a wealth of helpful material to use. While not going so far as creating a course coordinator, the philosophy of the Community of Practice is in line with Dr. Beery's suggestion to guide College Algebra (MATH 113) instruction and develop the curriculum. Due to COVID-19, the Community of Practice has not met since the latter part of Spring 2020. The Community of Practice will resume in 2022.

New Hires:

Dr. Beery recommended that we hire an additional statistics or applied mathematics faculty member and an additional mathematics education faculty. We have not had a net change in the number of T/TT statistics faculty members (we have 2), but we were able to hire a full-time instructor (Holly Mitchell) in Fall 2017 who primarily teaches introductory statistics courses. In Spring 2020, we were able to hire an applied mathematics faculty member (Dr. Megan Wendler) to replace a mathematics faculty member who had retired. We have not changed the net number of mathematics education faculty members (one T/TT and one full-time instructor). Those faculty members primarily teach courses for our Elementary Education students.

d. **Mission statement and goals**

The CMU Institutional Mission states:

> *Committed to a personal approach, Colorado Mesa University is a dynamic learning environment that offers abundant opportunities for students and the larger community to grow intellectually, professionally, and personally. By celebrating exceptional teaching, academic excellence, scholarly and creative*

activities, and by encouraging diversity, critical thinking, and social responsibility, CMU advances the common good of Colorado and beyond.

The mathematics program faculty and staff are devoted to meeting the CMU mission statement goals. Our mathematics courses are designed to strengthen the ability of students to think critically and analytically, to communicate their reasoning clearly and effectively within a variety of contexts, and to develop an awareness of mathematics in the world around them. These skills are essential for post-graduate success and lifelong learning. To that end, the CMU Mathematics Program Mission states:

> *The Colorado Mesa University Mathematics and Statistics Faculty work enthusiastically to help all students obtain the level of quantitative literacy required for their personal and professional success. We cultivate a growth mindset that encourages our non-STEM majors to develop an appreciation for the mathematics that is relevant to them, and for our STEM majors and professional students we provide a foundational core and engaging classroom experience that encourages independent thinking and development of critical thinking and problem-solving skills. We develop mathematical fluency, creativity, and knowledge in our majors and minors, preparing them for their future careers and graduate studies.*

The Mathematics program faculty are currently working to review and update the Student Learning Outcomes (SLOs) for our courses, in part to ensure that we meet the objectives stated in the CMU Mathematics Program Mission. The current Mathematics Program SLOs can be found in Section 5 of this document.

e. **Support of other programs**

Every student earning a B.S. or a B.B.A. degree from Colorado Mesa University must pass College Algebra (MATH 113) or higher, and students earning a B.A. degree must pass Mathematical Investigations (MATH 110) or higher in order to meet their Essential Learning mathematics requirement. These two courses alone constitute approximately half of all mathematics courses taught each semester.

Additional mathematics and statistics courses are requirements for various associate and baccalaureate degrees. These include Probability and Statistics (STAT 200), Statistics for Social and Behavioral Sciences (STAT 215), Statistics and Quality Control for Engineering (STAT 305), Calculus for Biological Sciences (MATH 146), Calculus for Business (MATH 121), Calculus I, II and III (MATH 151, 152, 253), Engineering Calculus I and II (MATH 135, 136), Differential Equations and Linear Algebra (MATH 236), Discrete Structures (MATH 369), Numerical Analysis (MATH 361), a three course sequence for all Liberal Arts Majors in the Elementary Education option (MATH 105, 205, 301), and Explorations in Mathematics for Elementary Educators (MATH 389). These courses are all taught by faculty in the Department of Mathematics and Statistics. Thus, the department plays a vital role in delivering mathematics and statistics coursework for numerous programs on campus. As such, it is critical that the content of these support courses be appropriate for the associated disciplines. The content of these

courses must not only help students to acquire mathematical literacy, but also must provide them with the specific skills necessary for their success in future coursework in their chosen degree programs. To succeed in this endeavor, members of the mathematics faculty meet periodically with members of other departments to review content and software usage in these service and support courses.

f. Locational/comparative advantage

Colorado Mesa University is the largest university in western Colorado and the Department of Mathematics and Statistics offers programs that are not offered by other institutions in the region. One is a concentration in statistics supported by two tenured faculty with Ph.D. degrees in statistics. Our statistics faculty and students regularly perform data analysis for local businesses and individuals in need of statistical consulting, often as part of our Senior Seminar (now Senior Capstone) courses. This provides opportunities to build connections with members of the local community and provides a service to our region. A relatively new concentration in applied mathematics incorporates best-practice recommendations from the Mathematical Association of America and the Society of Industrial and Applied Mathematics. Beyond the common core of classes shared with the general mathematics major, this concentration includes additional coursework in mathematical modeling, computer programming and statistics. Our program also offers a Graduate Certificate in Applied Mathematics which can be paired with CMU's Master of Arts in Education degree. The certificate is intended to provide licensed secondary mathematics teachers the credentials required by the Higher Learning Commission to teach concurrent college or university mathematics courses. Finally, CMU offers a concentration in actuarial sciences, which is something that few institutions of higher learning in Colorado offer.

g. Engaging students from diverse backgrounds

Mathematics faculty create personal connections both inside and outside the classroom that benefit all students, including students from underserved or underrepresented groups. Faculty learn and use each student's name, respectfully answer questions in class, help students during office hours, and reach out to students who are struggling in a course with suggestions and encouragement. Faculty also employ a variety of teaching styles to serve the diverse learning styles represented in the classroom. Different course modalities (e.g., online courses) serve the needs of certain students, and some courses offer alternative schedules to aid students. For example, College Algebra (MATH 113) offers a late-start course designed to be paired with a preparatory course at the start of the semester. In a variety of ways, we serve a variety of students at CMU.

In addition to the above efforts, faculty also relate to students through shared experience. On occasion conversations in Spanish between faculty and students can be heard in the hallways. With a tenured/tenure-track faculty group consisting of almost 40% women and including bilingual faculty and faculty who were first in their families to attend college, we are well-suited to connect with a CMU student population consisting of 20% Hispanic students, 44% first-generation students, and 18% non-traditional students.

h. Unique characteristics of the program

The mathematics program is rigorous and offers many curricular opportunities that are not typically found in mathematics programs at schools of similar size and with a similar mission.

- Concentrations in Mathematics, Applied Mathematics, Secondary Education, Statistics, and Actuarial Science.
- Rotational offering of courses which allows a variety of upper division electives that are not typical in a mathematics program of similar size. This is supported by a departmental faculty with a wide range of mathematical interests.
- An introduction to the major through a first-year seminar course
- An individualized capstone experience. This includes an opportunity to work one-on-one with a faculty member on a research project in statistics or mathematics theory, pedagogy, or application. This experience helps students bridge the gap from coursework to deeper learning through connecting ideas from across the curriculum.
- A strong secondary education program of coursework that exceeds the state requirements for secondary licensure.
- Ample opportunities within the department for students to serve as study group leaders and tutors. These opportunities are especially important for future teachers and for students planning to seek teaching assistant positions in graduate school.
- A Graduate Certificate in Applied Mathematics which provides the credentials required by the Higher Learning Commission for licensed secondary mathematics teachers to teach concurrent college or university mathematics courses.

2. Curriculum

a. Description of curriculum (in terms of breadth, depth, and level of the discipline)

The Mathematics major offers Concentrations in Mathematics, Secondary Education, Applied Mathematics, Statistics, and Actuarial Science. The courses offered through these concentrations are designed to help students develop problem-solving, logical, and critical thinking skills. With a major in mathematics, students gain a broad general understanding of mathematics, and a deep understanding of at least one area of mathematics. The curriculum for each of the five programs aligns with best practice recommendations. For example, the mathematics and applied mathematics curriculum are consistent with recommendations given by the Mathematical Association of America Committee on the Undergraduate Program in Mathematics (MAA CUPM). Also, the programs share innovative core courses specifically designed to address specific goals of the programs, such as Topics and Careers in Mathematics (MATH 150) and Senior Capstone (MATH 492) that are described with additional detail below. The programs are regularly maintained by the faculty to ensure quality and currency of instruction.

Each of the five concentrations in the major share a common core curriculum. The core classes include Calculus II (MATH 152), Topics and Careers in Mathematics (MATH

150), Computational Linear Algebra (MATH 225), Calculus III (MATH 253), Senior Capstone (MATH 492), either Probability and Statistics (STAT 200) or Introduction to Business Analysis (STAT 241), and a choice of basic computer science courses, either Beginning Programming (CSCI 110), Foundations of Computer Science (CSCI 111) or Introduction to Engineering Computer Science (CSCI 130). Topics and Careers in Mathematics is a unique course specifically designed for our program. Students take this course in their first year of studies. In this course they are exposed to the different branches of mathematics and the different career options available with a mathematics degree. The students also learn basics of investigation, writing papers, and giving presentations. At an early stage in the program, this course helps students to best choose their course of study among the different concentration offerings. In addition, this course is ideally suited to capture students with an interest in mathematics but who in the past may have chosen a different major because they perceive them to offer better career options. The computer science courses (CSCI 110/111/130) provide our students with important foundation skills in computer science and programming, a common requirement both for coursework and careers. The Computational Linear Algebra (MATH 225) course was added to the core recently. With the widespread use of linear algebra in so many disciplines and applications of mathematics, this course serves our students well. As a 200-level offering, students learn all the essentials of linear algebra in a way that is accessible (without proof-writing prerequisites), while also laying a solid foundation for additional courses that make use of principles of linear algebra. Another course specifically designed for our program is Senior Capstone (MATH 492). This capstone experience draws on the students' coursework in our different concentrations and their individual interests in mathematics. They complete a program of study in which they develop research and library skills, as well as extensive writing and presentation skills. The course culminates with a project on a self-selected topic consistent with the student's concentration area. This project includes a poster presentation to the faculty together with a written paper that is evaluated by their research mentor and at least one other faculty member. Thus the core coursework for the concentrations in the mathematics program fosters common content knowledge and important professional skills.

Beyond the common core, the requirements and electives for the different concentrations add content depth and breadth. For example, students in the Mathematics, Secondary Education, and Applied Mathematics Concentrations take Introduction to Advanced Mathematics (MATH 240). This four-credit course provides a bridge experience between the more computational lower-level courses and the more abstract and proof-based upper-level courses. This course develops the logic and proof-writing skills essential to upper-level courses while also introducing students to important concepts in number theory, analysis, and algebra. Students in the Statistics and Actuarial Science Concentrations are not required to take Introduction to Advanced Mathematics (MATH 240), and instead take other courses specific to their disciplines. Since each of the concentrations offer more specialized upper-level curriculum, these will be described separately.

In the Mathematics Concentration, the required courses beyond Introduction to Advanced Mathematics (MATH 240) are Number Theory (MATH 310), Advanced Calculus (MATH 352), Intro to Real Analysis I (MATH 452), and Abstract Algebra I (MATH 490). The Number Theory and Advanced Calculus courses provide a transition to the more challenging and rigorous Intro to Real Analysis I and Abstract Algebra I courses in terms of content and proof-writing. In addition to meeting program learning objectives, these courses will also help prepare students for graduate programs in mathematics. Beyond the required courses, students also choose four upper-level program electives. These courses primarily come from the combined offerings of both the Mathematics and Applied Mathematics Concentrations. The number of options is a significant benefit to the students, as there are so many choices to match their interests. For example, students can elect to take additional courses in linear algebra, real analysis, and algebra, or explore new topics in courses such as topology, complex variables, numerical analysis, or modeling. Some of these courses are offered on a two-year cycle while others are offered on demand; still others are offered more frequently if they are required by the Applied Math Concentration.

The required courses beyond Introduction to Advanced Mathematics (MATH 240) in the Applied Mathematics Concentration are Differential Equations (MATH 260), Methods of Applied Math I (MATH 360), Mathematical Modeling (MATH 365), Methods of Applied Math II (MATH 366), Methods of Applied Math III (MATH 466) and Advanced Programming (CSCI 310). The Differential Equations course introduces students to basic analytical solution methods for elementary differential equations. The Mathematical Modeling course introduces students to the primary methods of mathematical modeling, including model construction (identifying and developing relationships between variables), empirical modeling (curve fitting), and simulation (Monte Carlo methods). Methods of Applied Math I covers vector calculus, analytical solution methods for basic partial differential equations, and series expansions of ordinary differential equations. This is followed in Methods of Applied Math II by numerical methods of solutions for many of the topics in Methods of Applied Math I, using both MATLAB and Python. Methods of Applied Math III incorporates advanced topics with additional emphasis on modeling, numerical methods, and independent student work. The Differential Equations course is a prerequisite for Methods of Applied Math I and provides the differential equations foundation necessary for the core sequence of courses Methods of Applied Math I, II, III. While Mathematical Modeling is not a prerequisite for Methods of Applied Math III, students are advised to take Mathematical Modeling before Methods of Applied Math III. Since programming is a common expectation in applied careers, the Advanced Programming course (CSCI 310) provides additional exposure to advanced topics in programming. Additional concentration electives in mathematics and statistics add breadth.

In the Secondary Education Concentration, the required courses beyond Introduction to Advanced Mathematics (MATH 240) are Number Theory (MATH 310), Advanced Calculus (MATH 352), Discrete Structures I (MATH 369), History of Mathematics (MATH 380), and Geometries (MATH 386). The Number Theory and Advanced Calculus courses provide a challenging and rigorous content experience for the secondary

education students. An additional concentration elective in mathematics or statistics deepens understanding of a particular area. The mathematics content in these courses, together with the emphasis on writing and methods of proof, will prepare our students to succeed in the classroom as future mathematics educators. Altogether, these upper-level courses provide students with depth and breadth across multiple subject areas in mathematics. Students in the Secondary Education Concentration do not have required 400 level courses in mathematics other than Senior Capstone (MATH 492). Instead, the curriculum during their senior year is devoted entirely to education courses, including Methods of Teaching Secondary Mathematics (EDUC 497C), and a full semester (12 credits) in Teaching Internship and Colloquia: Secondary (EDUC 499G). Students are required to pass their Praxis II exam before beginning their internship, and our courses help prepare our students for this exam. By completing the required and elective courses in the Secondary Education Concentration, our graduates meet national and state content standards in mathematics and are well positioned to succeed as mathematics educators.

In the Statistics Concentration, the required coursework beyond the Core includes Intro to Database (CSCI 260), Computational Statistics (STAT 301), Correlation and Regression (STAT 312), Mathematical Statistics I (STAT 350), Mathematical Statistics II (STAT 351), and Design and Analysis of Experiments (STAT 425). Additionally, students take either Introduction to Advanced Mathematics (MATH 240) or Discrete Structures I (MATH 369), as well as three upper-level electives from a list that includes Sampling Techniques (STAT 313), Categorical Data Analysis (STAT 430), Introduction to Time Series (STAT 435), and several applied mathematics courses. This course listing is intended to strike a balance between application and theory. It was updated beginning with the 2019 – 2020 academic year to better meet the needs of our students, utilize the expertise of our faculty, and offer a comparable degree to those found at nationally-recognized and peer institutions alike. In Computational Statistics (STAT 301), students are introduced to R programming while also gaining deeper mastery of topics such as confidence intervals and hypothesis testing that would have appeared in an introductory statistics course. Students are also exposed to elements of big data analytics and data visualization within this course, which acts as a bridge between lower- and upper-level statistics content. The mathematical statistics sequence, Mathematical Statistics I/II (STAT 350/351), is typically regarded by students as the most difficult pair of classes in their program, as these courses are proof-based and provide a deep understanding of statistical theory. Conversely, Correlation and Regression (STAT 312) and Design and Analysis of Experiments (STAT 425) offer extremely practical applications on real-world data sets and the opportunity to employ both the design and analysis skills required of practicing statisticians in various fields, though the theoretical underpinnings of these methods are discussed in both courses. Finally, in rounding out the program, the statistics electives mentioned above offer a blend of theory and application, with the opportunity for both mathematical proof and application to historically significant data sets, while Introduction to Database (CSCI 260) provides valuable exposure to computing techniques for working with large collections of data.

In the Actuarial Science Concentration, the requirements include several of the same courses required in the Statistics Concentration, such as Intro to Database (CSCI 260),

Computational Statistics (STAT 301), Correlation and Regression (STAT 312), Mathematical Statistics I (STAT 350) and Mathematical Statistics II (STAT 351). However, they are also required to take many interdisciplinary courses such as Quantitative Decision Making (CISB 341), Principles of Macroeconomics (ECON 201), Econometrics (ECON 415), Risk Management (FINA 310), and Life and Health Insurance Licensure and Financial Planning (FINA 412). These additional requirements are consistent with professional expectations and recommendations from major governing bodies in the field, including the Society of Actuaries and Casualty Actuarial Society. These prescribed courses are part of a professional degree program that is a blend of business, mathematics, and statistics coursework, and though students in this concentration take fewer mathematics and statistics courses than our other concentrations as a result, they still have many of those same courses available as electives, of which they are required to take three. One important item to note is that Senior Capstone (MATH 492), will look different for actuarial science students as compared to the other concentrations. This is because these students are focused on preparing for the successful completion of the first two professional actuarial exams: the probability (P) exam and the financial mathematics (FM) exam. In Senior Capstone, rather than conducting original research, these students will present detailed and thorough explanations of the solutions to several questions from past versions of these exams. In this way, they will be both preparing for their required exams and practicing the professional writing and presentation skills that are invaluable in the actuarial science profession.

In addition to the mathematics majors, students majoring in Liberal Arts: Elementary Education can choose mathematics as one of their three possible concentrations. Beyond the common elementary education curriculum, the concentration comprises 15 credits in mathematics, statistics, and computer science. Choices in two of these areas allow students to take either mainstream courses or versions specifically designed to combine rigor with their needs in an elementary classroom. Students may choose either the standard Calculus I (MATH 151) course or Calculus for Biological Sciences (MATH 146). Despite the name, the latter course is basically an applied calculus course designed for science students who do not intend to take further calculus courses. We have redesigned this course to include a substantial data analysis and modeling component to help students understand how the mathematical functions arise. The calculus is motivated through practical applications. Similarly, the students can choose between Beginning Programming (CSCI 110) or Technology for Mathematics Educators (CSCI 305). The latter course (taught by a mathematics education professor) maintains an emphasis on algorithmic thinking, but through block-based visual programming and spreadsheets with macros. Students also create a webpage. This approach is much more accessible for most of the elementary education students than text-based coding and gives them tools that they can use in their careers. Students also take Explorations in Mathematics for Elementary Educators (MATH 389), which is a one credit course to expose them to areas of mathematics they do not encounter in their basic coursework. Students also have an additional choice of an elective from a list of five. Most students take Euclidean Geometry (MATH 305). This course is specifically designed for the elementary ed concentrators to emphasize conceptual and hands-on approaches rather than a heavy proof base. Altogether, this concentration provides the students with a solid basis for

them to be the mathematics experts in their elementary school packaged with tools and concepts that can directly translate to their classrooms.

b. **Program currency (curricular changes since last program review)**

There have been substantial curriculum changes, program modifications, and program additions made since the last department review. Many of these changes were made in response to recommendations and discussions arising from the previous program review while others were in response to university constraints (such as minimum enrollment numbers required for upper-level courses in the major). The various changes for each of our five concentrations are highlighted and discussed below.

For the mathematics program, there was a significant redesign beginning with the 2019 – 2020 academic year. New courses include Topics and Careers in Mathematics (Math 150), Computational Linear Algebra (MATH 225) and Senior Capstone (MATH 492). These courses, whose descriptions were given previously, were part of a reconfiguration of our course offering and course sequencing in the mathematics major. Prior to our program redesign, to satisfy our program objective for content depth, our majors took both Real Analysis I (MATH 452) and Abstract Algebra I (MATH 490), followed by their choice of either Real Analysis II (MATH 453) or Abstract Algebra II (MATH 491). Student also took a two-semester sequence in Senior Seminar I and Senior Seminar II (MATH 484, MATH 494). The senior seminar sequence was offered every year in a Fall-Spring rotation, while the real analysis and abstract algebra courses were offered every other year. The prerequisite pathway for these upper-level courses was Introduction to Advanced Mathematics (MATH 240) and Linear Algebra (MATH 325). These courses needed to be taken by the student's sophomore year, so that they would meet the prerequisites for taking either Real Analysis I or Abstract Algebra I in their Junior year. However, some students were not adequately prepared for the rigors of these 400-level courses and retaking a course or switching into the major beyond the third semester would often lead to an additional year in the program. Also, once CMU introduced a December Commencement in 2014, there became some demand for a Spring-Fall rotation of the senior seminar sequence. For these and other related reasons, a pattern emerged in which we were offering additional sections of required courses during off semesters with enrollment levels that were below university requirements. In the redesign, Topics and Careers in Math (MATH 150) captures students in their first year and gets them on the right program track early in their curricular trajectory. With the introduction of Computational Linear Algebra (MATH 225) as a new core course requirement, Linear Algebra (MATH 325) was switched from an annual required course to an every-other-year elective offering. After their core courses, the prerequisite pathway to the upper-level courses is now Introduction to Advanced Mathematics (MATH 240). Students now take the Fall-Spring sequence Number Theory (MATH 310) and Abstract Algebra I (MATH 490) and the Spring-Fall sequence Advanced Calculus (MATH 352) and Real Analysis I (MATH 452). Students continue to take upper-level math electives, which now include Real Analysis II and Abstract Algebra II. Each of the required courses are offered every year, as opposed to the alternating year plan in the previous program. This more streamlined approach provides students with the ability to

meet our program objectives and still finish their program requirements successfully and on-schedule.

The Applied Math Concentration is a new program that began in Fall 2017. The idea for this concentration arose from faculty discussions following the previous program review. In order to attract and retain students who liked math but were not drawn towards pure mathematics, an applied concentration was proposed. As mentioned earlier, new classes created include Methods of Applied Mathematics II (MATH 366) and Methods of Applied Mathematics III (MATH 466). Ongoing modifications regarding elective options and routine program maintenance continue to enhance this concentration. When this program was originally designed, best practice recommendations for applied programs were adopted from the MAA CUPM Guide and from SIAM publications. These recommendations emphasized the importance of additional coursework in linear algebra, computer science, and statistics. For the linear algebra piece, Computational Linear Algebra (MATH 225) was introduced as a requirement to the program, along with Linear Algebra (MATH 325), a proof-based version. Students could also choose Advanced Linear Algebra (MATH 460) as an upper-level elective. Required coursework in computer science and statistics was also introduced into the program, with elective courses determined by the recommendations of computer science and statistics faculty. When the mathematics program underwent revisions in 2019 (see previous paragraph) with more streamlined offerings, Linear Algebra (MATH 325) was moved from a requirement in the applied math concentration to an elective. From the core sequence of Methods of Applied Mathematics I, II, and III, (MATH 360, MATH 366 and MATH 466) physics majors are required to take Methods of Applied Mathematics I (MATH 360).

The Secondary Education Concentration was redesigned for the 2019 – 2020 academic year to share a common core with the other concentrations. This included incorporating Topics and Careers in Mathematics (MATH 150) and Senior Capstone (MATH 492). While secondary education students are often drawn to their major because of their interest in teaching mathematics, these two courses help round out their understanding of mathematics and other related career choices, as well as exposing them to content-specific and educationally oriented research projects. These experiences are expected to be valuable for them in the future as they work with students and as education professionals in general.

The Statistics Concentration was also redesigned for the 2019 – 2020 academic year. The Statistics Concentration was modified at that time to share a common core with the other mathematics concentrations, including the addition of Topics and Careers in Mathematics (MATH 150), and Senior Capstone (MATH 492). In addition, three new courses were created for the statistics program, including Computational Statistics (STAT 301) with RStudio, Categorical Data Analysis (STAT 430), and Introduction to Time Series (STAT 435). These courses help provide a balance between application and theory in the Statistics Concentration. The curricular changes enable the program to better meet the needs of the students, better incorporate the expertise of the faculty, and to offer a comparable degree to those found at nationally recognized and peer institutions.

The new Actuarial Science Concentration received approval for Fall 2019 as well. This new program was created by bringing together existing courses, including courses in economics and finance, to create a new concentration option for our students. For students interested in mathematics and statistics, having the Actuarial Science Concentration as an option presents students with a career-specific program that was previously not possible with our majors.

In the Elementary Education major with a Mathematics Concentration, Computational Linear Algebra (MATH 225) was added as an elective choice to provide an offering in the spring semester since Ethnomathematics (MATH 340) is not currently being taught due to a retirement. Calculus for Biological Sciences (MATH 146) has been modified to better reflect the needs of the elementary education students who are the main audience for the course. The course is currently under departmental review and is likely to be renamed (perhaps Applied Calculus) and redesigned.

c. **Program delivery (locations & formats; how it has shifted to meet changing needs of students)**

All courses in the mathematics program are offered on the main campus and some of those courses, primarily Essential Learning courses, are also offered at the Montrose campus, at Western Colorado Community College (a branch of CMU), and at select regional high schools as part of the High School Scholars Program. The Essential Learning courses, Mathematical Investigations (MATH 110), College Algebra (MATH 113), and Probability and Statistics (STAT 200) are offered in a standard classroom format and online every semester. These courses are offered on-site every semester including summer term and at least once a year in the evening to accommodate as many students as possible. We also offer a late-start option and/or in a two-day a week format. For students who need to move at a slower pace, College Algebra (MATH 113) has also been offered as a five-day a week course.

Many of our mathematics and statistics courses are offered every semester. But, as mentioned earlier in this document, some courses are only offered once a year and yet others are offered on a rotating basis which allows us to offer a variety of upper-division courses.

The department offers a two-course mathematics content sequence Elements of Mathematics I and II (MATH 105 and 205) required of all Early Childhood Special Education majors and Elementary Education majors. The latter also take a third course Mathematics for Elementary Teachers (MATH 301). These courses, as well as most of the courses for Mathematics Concentrators in the Elementary Education major, are all offered online and in a classroom that has tables and several large cabinets of manipulatives, teaching tools, fraction calculators, and demonstration resources. Students regularly participate in group activities using these resources. All these courses are taught with a large emphasis on collaborative activity-based discovery learning and limited lecturing. This venue and teaching approaches all accord with best practices based on

educational research and alignment with the Colorado Academic Standards (which are closely coordinated with the Common Core State Standards).

During the COVID-19 pandemic, remote delivery was required during the second half of the Spring semester of 2020 and the last three weeks of the Fall 2020 and Spring 2021 semesters. A description of our COVID-19 program delivery methodologies is included in Section 7 of this document.

3. **Analysis of Student Demand and Success**

a. **Number of majors (by concentration) and minors**

Our Bachelor of Science degree in mathematics has five different concentrations available. In the summary table below, we include the number of majors in each of the concentrations to identify patterns for growth.

With the introduction of the Applied Math Concentration in 2017, we saw the number of students concentrating in Mathematics decrease when some switched to the Applied Mathematics Concentration. However, as the applied math program becomes more established, we believe we will continue to see growth in that program and thus in the overall number of majors. Recent curricular changes (implemented Fall 2019) were designed to streamline the requirements and course offerings for the Mathematics and Secondary Education programs and to facilitate the development of cohorts with the aim to grow those programs. Additionally, the Actuarial Science Concentration was introduced in Fall 2019 and will be promoted through recruitment efforts targeting both current and future Colorado Mesa University students.

	Majors by Program and Academic Year - First Majors(Total Majors)							
Deg.	Program	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
BS	Mathematics	30(41)	29(37)	30(36)	21(25)	21(25)	17(21)	18(23)
BS	Applied Mathematics	-	-	-	3(6)	5(8)	15	19(20)
BS	Secondary Educ/ Pre-Secondary Ed	34(35)	27(28)	22(23)	22	19	17	23
BS	Statistics	12(14)	10(11)	15	16(17)	16(17)	11	8(9)
BS	Actuarial Science	-	-	-	-	-	1	4
	Total Declared BS First Majors	76	66	67	62	61	60	72
	Total Declared BS	90	76	74	70	69	64	79
BA	Elementary Educ/ Pre-Elem Educ	51	47	53(54)	47	37	26	24

AS, PB	AS Math/ Provisional Bacc	8	9	7(8)	7(11)	4(8)	8(10)	4(6)
AS	Lib Arts - Undecided, NatSc/Math	9	6	3	1	-	-	-
Grad	Graduate Certificate	-	-	-	4	4	6(9)	6(7)
	Total (first Major)	144	128	130	121	106	100	106
	Total (All majors)	161	140	139	133	118	109	116

While the last row of the table shows that the overall total number of majors has decreased significantly over the past seven years, the data also reveals that the decrease is primarily due to a drop in Bachelor of Arts students majoring in Elementary Education with a Concentration in Mathematics. The number of students with this declared major decreased by over 50% from Fall 2014 to Fall 2020 which corresponds to an overall decline in completed bachelor's degrees in education at CMU and nationwide (https://nces.ed.gov/programs/digest/d20/tables/dt20_322.10.asp). We also see a drop in total majors from no longer counting "Undecided" Liberal Arts students in the total after 2017.

The number of students minoring in mathematics or statistics has been consistent over the last few years and we expect to maintain similar numbers as the course requirements are designed to pair well with other majors including Computer Science and Physics.

Minors by Subject and Academic Year							
Minor	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Mathematics	22	22	26	32	32	29	28
Statistics	4	5	8	9	3	5	5
Total	26	27	34	41	35	34	33

b. Registrations and student credit hours by student level

The average fall semester enrollment at Colorado Mesa University from 2014-19 was 9499 students. The number of students enrolled in mathematics or statistics courses ranged 4227 - 4531 in the academic years from 2014-15 to 2019-20 with an average of 4374 students per year. During that period, the total student credit hours (SCH) ranged 15623-16844 and averaged 16095.

The average SCH by class level are found in the table below. Note that the year 2020-21 was affected by the COVID-19 pandemic and is not included in the averages here, but data for that year can be found in Appendix B. Also note that some of the values do not sum to the displayed totals due to the inclusion/exclusion of Milestone (ESSL 290) courses taught by mathematics faculty.

	Total Students Enrolled (Avg)	Total SCH (Avg)	First-year SCH (Avg)	Sopho-more SCH (Avg)	Junior SCH (Avg)	Senior SCH (Avg)	Graduate SCH (Avg)	Non-degree seeking SCH (Avg)
Average Number of Student Credit Hours (SCH) by Course Level from 2014-15 to 2019-20								
MATH	3337	12779	3619	4863	2276	1840	-	161
STAT	1017	3258	101	1262	1125	760	-	10
TOTAL	4374	16095	3720	6125	3401	2600	25*	171
								*After 2015

The majority of students enrolled in mathematics are at the first-year and sophomore levels which corresponds to our most common service courses for Essential Learning, Mathematical Investigations (MATH 110) and College Algebra (MATH 113). These courses are also prerequisites for our Probability and Statistics (STAT 200) course, resulting in the increase in SCH for statistics at the sophomore and junior levels.

Students also sometimes delay taking their required math courses or take prerequisite or developmental education courses before reaching their required mathematics course(s). Therefore, looking at SCH by course-level, as in the next table, is also informative.

c. **Registrations and student credit hours (fall and spring) subtotaled by course level**

The table below highlights the service-nature of our department with over 68% of student credit hours taken at the 100-level and over 25% taken at the 200-level.

Note again that the year 2020-21 is not included in the averages here but data for that year can be found in Appendix B. Also note that some of the values do not sum to the displayed totals due to the inclusion/exclusion of Milestone (ESSL 290) courses taught by mathematics faculty.

	Total Students Enrolled (Avg)	Total SCH (Avg)	100-level SCH (Avg)	200-level SCH (Avg)	300-level SCH (Avg)	400-level SCH (Avg)	500-level SCH (Avg)
Average Number of Student Credit Hours (SCH) by Course Level from 2014-15 to 2019-20							
MATH	3337	12779	11053	1015	569	112	-
STAT	1017	3258	0	3101	124	32	-
TOTAL	4374	16095	11053	4116	693	144	38*
							*After 2017

d. Number of graduates (by concentration)

The table below shows the number of mathematics graduates by degree and program. Though the number of graduates appears relatively stable over this review period, we expect our numbers to start increasing in one to two more years as a result of the curricular changes that were implemented in Fall 2019. These changes were designed to encourage recruitment and retention to the major through natural formation of student cohorts. The changes were also intended to reduce barriers to on-time graduation through modifications to course prerequisites and offerings.

The first graduate with an Applied Math Concentration was in 2020-21 with six more expected in 2021-2022. We expect our first graduate in the Actuarial Science Concentration in 2021-2022 as well.

Degree	Program	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Graduates by Program and Year - First Majors (Total Majors)								
BS	Mathematics	6(7)	6	6(7)	2(3)	3(4)	2(3)	5(6)
BS	Applied Mathematics	-	-	-	-	-	-	1
BS	Secondary Education	2	6	0	2	0	3	3
BS	Statistics	2	5	3	2	8	3	1
BS	Actuarial Science	-	-	-	-	-	-	-
	Total BS degrees awarded	10(11)	17	9	6(7)	11(12)	8(9)	10(11)

BA	Elementary Education - Math	4	4	10	5	9	7	8
AS	Mathematics	1	2	1	0(1)	2	0	2
Grad	Graduate Certificate	-	-	-	-	3	1	4
	Total (first Major)	15	23	20	11	25	16	24
	Total (All majors)	16	23	21	13	26	17	25
minor	Math and Stat minors completed	8	10	3	14	15	10	16

e. Student successes/recognitions

Mathematics students graduate with a versatile skill set, applicable to a wide array of fields and employment types. From our alumni survey, thirteen students are pursuing (or have completed) graduate degrees. One of these students has completed a PhD in Statistics Education and is now an assistant professor. A recent graduate is pursuing a PhD in Statistics, and another is pursuing a Master of Science degree in Biostatistics. Two graduates (Heath Hillman and Patrick Snyder) completed Master of Science degrees in Mathematics and were hired at CMU as full-time instructors. Almost all the graduates of the Secondary Education Concentration are now teaching. Two students attended summer REU programs, with one resulting in a publication. Between 2018 and 2021, a total of 26 mathematics students presented their Senior Seminar/Capstone projects at the campus-wide CMU Student Showcase Symposium. Two of these projects resulted in publications in peer-reviewed mathematics journals, with the student as sole author or co-author.

4. Program Resources

a. Faculty

Full-time faculty teach 24 credit hours per academic year. With courses ranging from 3-5 credits, faculty typically teach three courses with different course preps each semester. Tenured and tenure-track faculty often handle 10 different course preps over two years, including 1-2 new course preps, while full-time instructors may teach multiple sections of the same course each year or even semester. In addition to the faculty who teach on the main campus, one full-time instructor teaches exclusively on the Montrose campus and one part-time lecturer teaches fully online.

All faculty are evaluated on Teaching Effectiveness by the Department Head each year. In addition to teaching, tenured and tenure-track faculty are also expected to contribute in the areas of service, scholarship, and advising and are evaluated on these three categories as well.

1) Ratio of full-time equivalent students (FTES) to full-time equivalent faculty (FTEF)

The table in this section shows the ratio FTES/FTEF as a measure of student-to-faculty ratio. To compute full-time equivalency, we use FTEF = CCH/24 and FTES = FTES/30. From academic years 2014-15 to 2020-21, the number of full-time equivalent students (FTES) ranged 520.8 - 561.5 and the number of full-time equivalent faculty (FTEF) ranged 25.4 - 27.1.

Prior to 2020-21, the overall FTES/FTEF ratio for our department was consistently near 20.6. This is a consequence of our 100-level mathematics and 200-level statistics courses regularly filling to capacity. In other words, when we had the faculty to offer more sections of our introductory courses, we saw a proportional increase in SCH. On average, for every course credit hour (CCH) offered in our department, we gain 25.8 student credit hours (SCH).

Ratio by Year and Subject FTES / FTEF							
	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21*
ESSL			22.4		22.8	24.8	22.8
MATH	19.8	20.2	19.9	19.5	19.9	20.3	16.3
STAT	24.0	24.6	24.9	25.3	22.2	23.3	25
Total FTES/FTEF	20.5	20.9	20.7	20.5	20.4	20.8	17.7
Total SCH/CCH	25.6	26.1	25.9	25.7	25.4	26.1	22.13
*Note, the 2020-2021 academic year was affected by the COVID-19 pandemic with lower enrollment and reduced course capacities.							

2) Course credit hours and student credit hours by faculty type (tenured/tenure-track (T/TT), instructor (FT nonTT), lecturer (PT))

Our SCH is closely tied to our CCH, however we see in the table below that from 2018-19 to 2019-20, the course credit hours went down while the student credit hours increased. This may be attributed to the program modifications for Fall 2019 which streamlined course requirements and course sequencing, reducing the number of low-enrolled upper division courses offered and allowing for more sections of lower-division courses with higher enrollment to be offered.

Course Credit Hours (CCH), Student Credit Hours (SCH), and Faculty Headcount by Year												
	CCH				SCH				Head Count			
	T/TT	FT Non-TT	PT	Total	T/TT	FT Non-TT	PT	Total	T/TT	FT Non-TT	PT	Total
2014-15	307	221	91	619	6521	6426	2898	15845	13	8	10	31
2015-16	319	209	103	631	7048	6498	2940	16486	13	8	11	32
2016-17	292	249	109	650	6087	7524	3233	16844	12	9	10	31
2017-18	285	274	50	609	5957	8256	1410	15623	12	11	7	30
2018-19	285	280	58	623	5844	8352	1652	15848	13	11	5	29
2019-20	276	313	22	611	5740	9363	820	15923	12	12	2	26
2020-21*	302	343	30	675	6047	7888	1005	14940	13	13	3	29
*Note, the 2020-2021 academic year was affected by the COVID-19 pandemic.												
Note, a minimum of 3 CCH of Computer Science courses taught by FT faculty members in the Department of Mathematics and Statistics are not included in the CCH and SCH data here.												

The next table compares the full-time equivalent faculty (FTEF), which is the total number of full-time faculty necessary to teach the number of credits offered, to the actual full-time faculty headcount each year. For example, we see that in 2018-19, courses were offered that equated to 26 full-time faculty positions with only 24 full-time faculty in the department. Some of the additional courses were taught by part-time lecturers while the remaining were covered by overload assignments to full-time faculty. Since 2019-20, an effort has been made reduce faculty overload assignments.

Comparing FTEF with Total FT Faculty Headcount						
	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
CCH	619	631	650	609	623	611
FTEF	25.8	26.3	27.1	25.4	26.0	25.5
Total FT	21	21	21	23	24	24*
FT T/TT	13	13	12	12	13	12
FT Non-TT	8	8	9	11	11	12*
*Note, in 2019-20 temporary FT faculty are included in the FT faculty count whereas prior years may not include those faculty in the FT headcount.						
Note, a minimum of 3 CCH of Computer Science courses taught by FT faculty members in the Department of Mathematics and Statistics are not included in the CCH values. The CCH values affect the FTEF by at least 3/24= 0.125.						

3) Faculty successes/quality/recognitions.

The CMU mathematics faculty have had a variety of successes over the last review period. Two faculty (Tracii Friedman and Cathy Bonan-Hamada) were awarded MAA Tensor Women and Mathematics grants in 2018, 2019, and 2020 to create and run a mathematics camp for middle-school girls called GirlsDoMath Camp. Both the 2018 and 2019 week-long camps included numerous mathematical activities, talks by CMU students, alumni, and faculty, and invited speakers from outside campus. The grant received in 2020 will be used for the 2022 GirlsDoMath Camp.

In Fall 2018, Dr. Brian Winkel, Director of SIMIODE (Systemic Initiative for Modeling Investigations and Opportunities with Differential Equations) invited Lisa Driskell, Cathy Bonan-Hamada, and Tracii Friedman to create a faculty development program for use by universities that would be host schools for SCUDEM, an international mathematics modeling competition with over 40 sites. Based on the success of the initial program, these faculty were invited to build additional content for two subsequent competitions. They received a letter of commendation from Dr. Winkel for their work.

Besides the faculty development program, Lisa Driskell has published two modelling scenarios for Differential Equations in SIMIODE. She also developed and co-led a minicourse at a MAA MathFest national meeting, a MAA virtual webinar, and co-authored a section in a book comprised of tactile course activities. Since 2020, Dr. Driskell has been the Chair of the MAA Committee on Early Career Mathematicians.

In 2017 Markus Reitenbach was awarded a sabbatical leave to study the use of neural networks in finance, and in 2018 he co-developed (with a computer science faculty member) a Maverick Milestone course on the Bitcoin cryptocurrency. In 2016 Lisa Driskell co-developed (with a biology faculty) a Maverick Milestone course on numbers and patterns in nature, and in 2019 Dan Shultz-Ela co-developed (with a political science faculty) a Maverick Milestone course on natural disasters.

In 2014 Phil Gustafson was awarded a sabbatical leave which he used to develop a manuscript for a Fourier Analysis textbook. The first and second editions of the textbook were then published in 2017 and 2018. Dr. Gustafson also published an article for the BIG SIGMAA newsletter and lead the creation of both the Graduate Certificate in Applied Mathematics program, and the Concentration in Applied Mathematics, including course development for the programs.

During the review period Eric Miles published three mathematics research papers in peer-reviewed journals, including one that was co-authored by a CMU student. Dr. Miles also co-authored a textbook with a professor from Colorado State University and wrote a short pedagogical article detailing a classroom activity that was published in the newsmagazine of the Mathematical Association of America.

Math Extravaganza is an annual event held at CMU for high school students in the Grand Valley. The day's events include interactive math and computer science activities, lunch provided on campus and campus tours, as well as a keynote speaker and prizes. The four

events in the years 2017-2020 brought a total of 580 high school students to campus and involved many faculty and student volunteers. Eric Miles organized these events, both Lisa Driskell and Tracii Friedman gave keynote talks, and math activities were created and led by Ana Berrizbeitia, Rick Ott, Clay King, and Cathy Bonan-Hamada.

Other measures of the professional successes/quality/recognitions of the mathematics and statistics faculty include numerous regional and national presentations, including several that were invited; collaborations with community partners; mentoring of senior-level student research projects; and service on regional and national committees for professional organizations. Please see faculty vitas in Appendix C for additional faculty successes.

4) Faculty vitas

Faculty vitas can be found in Appendix C.

b. Financial Information

While most budget items are pre-determined, each year the Department Head has the opportunity to request additional funds through a budget process. Also, at the end of each fiscal year, some of the surplus funds from the approved budget are moved to a rollover fund which can be used for special projects or unexpected expenses.

1) Total budget revenues and program expenditures.

The table in this section shows the total expenditures of the program by fiscal year. Without course fees, the department does not have revenue. The complete list of program expenditures by fiscal year can be found in Appendix B.

The most significant impact to departmental expenditures is faculty salary and benefits. Total full-time faculty headcount increased by one in FY19 and by two in FY21 to increase the total expenditures those years. In addition, to incorporate a cost-of-living adjustments (COLA), full-time faculty salaries increased an average of 2% per year. Budget allocations for departmental supplies and faculty travel have remained the same since the previous program review.

Prior to FY20, some departmental expenditures funded budget items for the Computer Science program which shared the department with mathematics and statistics at the time. This includes an expenditure in FY19 of over $56,000 in rollover funds to equip a computer science lab classroom (Wubben Science 120) with retractable computer monitors.

Total Expenditures and Cost per Student Credit Hour by Fiscal Year			
Fiscal Year: Academic Year	Total Expenditures	Total Student Credit Hours (SCH)	Total Expenditures per Student Credit Hour
FY15: 2014-2015	$1,701,485	15845	$107.38
FY16: 2015-2016	$1,727,151	16486	$104.76
FY17: 2016-2017	$1,971,098	16844	$117.02
FY18: 2017-2018	$1,870,489	15623	$119.73
FY19: 2018-2019	$2,013,216	15848	$127.03
FY20: 2019-2020	$1,877,437	15923	$117.91
FY21: 2020-2021*	$2,080,896	14940	$139.28
*Note, the 2020-2021 academic year was affected by the COVID-19 pandemic.			

2) Ratio of expenditures/student credit hours.

The ratios of total expenditures per student credit hour by year can be compared in the table above (Section 4b1). Two high-cost years, FY19 and FY21, correspond to higher total expenditures those years. Note that FY21 was also affected by the COVID-19 pandemic with a decrease in enrollment and SCH, further inflating the cost per credit hour ratio.

3) External Funding

The Office of Academic Affairs at Colorado Mesa University has $100,000 (previously $75,000) in Faculty Professional Development Funds to award during one funding cycle each year. Faculty across campus submit proposals and may be awarded up to $3,000 per year to fund activities for professional growth. Faculty in the Department of Mathematics and Statistics have been successful over the years in receiving these funds, primarily to cover conference travel.

Faculty have also received various conference travel or registration grants through professional organizations and conference hosts such as the Mathematical Association of America (MAA) and the Mathematical Sciences Research Institute (MSRI). Additionally, in the past three years, three faculty members have been accepted as MAA Project Next Fellows with partial funding for registration and travel to three national mathematics conferences (including conferences that were virtual due to the COVID-19 pandemic).

Two faculty were awarded MAA Tensor Women and Mathematics grants in 2018, 2019, and 2020 to create and run a free mathematics camp for middle-school girls called GirlsDoMath Camp. One faculty member was funded on a project through St. Mary's Medical Center in Grand Junction, CO.

Potential opportunities for obtaining external funds during the next six years include PIC Math (Preparation for Industrial Careers in Mathematical Sciences) and the Robert Noyce Teacher Scholarship Program. These programs align with a department goal to prioritize the pursuit and promotion of opportunities related specifically to applied mathematics and education for both students and faculty.

c. Library Assessment

The detailed assessment by our library liaison is available in Appendix D. A summary is provided below.

Strengths: The library collection has a good selection of resources across most of the subject areas in mathematics. Access to ebooks through Springer and Oxford ebook collections adds a significant number of titles available to students. Current mathematics scholarship, including math education and actuarial science, is available through several databases. Further support is available through Prospector or interlibrary loan.

Weaknesses: A few topic areas of the book and ebook collections are weak, including the areas of ethnomathematics, business mathematics, and actuarial science.

Recommendations: Current materials related to program concentrations should continue to be acquired. Particular attention should be given to materials pertaining to actuarial science. Existing funds should be adequate to purchase new materials.

d. Physical facilities

Ideas regarding the facilities required to deliver good instruction for mathematics classes have changed since the last program review. The notion that effective teaching means lecturing well while students sit passively has changed. In part this is due to the research in cognitive science that has looked at learning and what is more efficacious. The current thought is that active learning through student engagement is more robust and positively impacts retention of the material and student attendance. Active learning often manifests in a more 'flipped model' of instruction where students are up at the board interacting with the instructor and their peers while working and getting feedback on problems. This method requires different classroom resources than those required for lecture-styled teaching. It also puts an emphasis on smaller class sizes.

The physical campus of the institution has experienced numerous changes, additions, and improvements since the previous program review. As a result, many of the previous concerns about facilities have been addressed. In addition to describing the physical facilities available to the mathematics and statistics programs, remaining shortcomings of those facilities and the impact on instructional effectiveness will be addressed.

Classrooms:
Mathematics and statistics instruction is primarily done in Wubben Science Hall, although some courses are also taught in Dominguez Hall, Escalante Hall, and Houston Hall. Class size ranges from between 5 and 30 students in most upper-level mathematics and statistics courses and between 25 and 50 in lower-level courses. All general classrooms have whiteboards and AV systems that include computers with network and internet access, document cameras, DVD players and projection screens. Most classrooms in Wubben Science have multiple whiteboards and thus provide adequate board space for longer computations or proofs and for students working in groups at the board. Classrooms outside of Wubben Science Hall often don't have adequate board space for some mathematics courses.

The Mathematics Education program currently uses a single classroom, Wubben Science 162, for most of its needs. This room contains locked cabinets for a large collection of manipulative teaching aids, geometry tools, calculators, and reference sources. The classroom has tables rather than desks, which is desirable, and has an integrated multi-media system. The collection of physical materials in the math education classroom is adequate, but the technology available could use an update to be more in line with technology currently available in elementary and secondary education classrooms. Though current mathematics education courses do not necessitate the use of technology such as smart boards and short throw boards, the addition of these items may be a benefit to the students who will later use them in their careers as teachers.

Some shortcomings of classrooms in Wubben Science Hall are described below.
- In some classrooms, visual access to board space is blocked by large podiums and computer screens at the front of the classroom and when the projector screen is down, more than half the board space at the front of the room is covered.
- Most classrooms in Wubben Science Hall are equipped with desks with small tops. To allow for more opportunity for group work and classroom activities, more rooms with movable tables are preferred.
- Temperature regulation problems persist in Wubben Science Hall, especially for classrooms on the south side of the building.
- It should be noted that classroom windows in Wubben Science Hall do not open, and the classroom doors open into the hallway and cannot be barricaded in the event of a lockdown scenario. The addition of interior locks on the doors would provide a safer refuge during a shelter-in-place situation.

The Mathematics Projects Lab (MPL):
The MPL (Wubben Science 112) is a room controlled exclusively by our department. It contains computers that have specialized software used in our mathematics and statistics courses. The room is used for courses that require this specialized software but is also available for use by students who are working on projects (upper division math/stat students in certain courses are given card access to the room). The room can be scheduled for departmental activities. The Math Club utilizes the room regularly and in fact, the MPL contains storage cabinets that are used primarily to store Math Club

materials. The MPL is used as a preparation area and/or training location for Math Extravaganza! and GirlsDoMath Summer Camp. It is also used for our Calculus Study Group/Tutor sessions and as a staging area for the projects math students do for the campus-wide Student Showcase each April. Having such a gathering place and workroom specifically designed for mathematics and statistics students undoubtedly has a positive effect in terms of recruitment, retention and development of majors. This resource has helped develop a culture of higher expectations and camaraderie between mathematics and statistics students. Besides providing a venue for group learning and team projects the MPL provides students with experiences that allow them to go beyond the theory they learn in lecture to its applications beyond the classroom and it is consistent with Colorado Mesa's goal of providing the quintessential small college experience

Additional workspace:
For students who do not have card access to the MPL, there is a common work area outside the MPL with tables and a whiteboard. In addition, there are small common workspaces with whiteboards where students and faculty can gather in each of the three bays of offices that house the mathematics and statistics faculty. This shared space can be used for office hours when faculty office space is not sufficient, a workspace for students to study, a place for students to makeup missed quizzes or exams, and a place for departmental committees to meet.

Faculty/Staff workspace:
All department faculty and staff have after-hours key-card access to Wubben Science Hall and all three bays of faculty offices.

Faculty offices are adequate though board space in each office is limited. An office can accommodate at most 2 or 3 students at a time during office hours. While there are small common workspaces where students and faculty can gather in each of the three bays of offices that house the mathematics and statistics faculty, this space is often used by students who are making up exams or quizzes.

The department's administrative assistant's workspace is in an open area located in the largest bay of mathematics faculty offices. The workspace includes locking cabinets which are the primary means of securing physical items. However, because of its location, the workspace can only be secured by locking the entire bay of offices.

The copy/mail room and storage room are adequate.

Some additional shortcomings of physical space in Wubben Science Hall are described below.
- The heating and cooling problems that plague classrooms in Wubben, also plague some faculty offices.
- There is a lack of a dedicated secure, quiet area for students to make up exams or quizzes. Makeup exams are often administered in the common areas in each office pod. This space is also used for office hours when faculty office space is

insufficient and is also sometimes used for intradepartmental meetings and social gatherings. Thus, the space is a less than desirable environment for exam taking.

- It would be nice to have a dedicated conference room and faculty lounge area available in Wubben Science Hall.

e. Instructional technology and equipment

Since the last program review, the use of technology by faculty and students has changed considerably. Most students and faculty members have personal digital devices such as smart phones, tablets, and laptops and there is Wi-Fi coverage over most of the campus. The number of applications available through the CMU network is extensive, including access to drives that allow for file sharing.

There are 231 technology-enhanced classrooms across campus. All general classrooms have AV systems and similar computing standards which provides the same teaching and learning experience from a technology standpoint. Specialized classrooms and labs may have additional technology. In particular, the Mathematics Project Lab has specialized software that is used in some upper-division courses.

The institution uses the Brightspace learning management system, also known as D2L. At a minimum, all faculty are required to post a syllabus, office hours and maintain a gradebook for each course they are teaching. Most faculty members choose to use additional course management features available through D2L. The office of Distance Education supports faculty use of D2L, maintains instructional videos on its use, and provides regular training on features of D2L.

The IT Department has developed and supported the campus digital hardware infrastructure. IT staff are easy to work with and eager to help resolve problems that faculty encounter with their technology.

On a less positive note, student misuse of internet resources in mathematics and statistics courses has increased. The ability to easily obtain solutions online to coursework (homework, project, take-home exams) makes for some challenges in assessing student knowledge. In addition, while the digital world we inhabit gives us freedom to explore widely, the co-opting of personal images and information is troublesome. Smart phones have the capability to record high quality video and photos, and software now exists that allows for the manipulation of video/audio. While CMU policy regarding faculty-produced digital material for work-related activities is delineated in the Faculty Handbook, copyright ownership of video taken of classroom activities by students (or non-CMU individuals) and then manipulated/edited is not clear and problematic.

f. Efficiencies in the program

There have been substantial curriculum changes, program modifications, and program additions since our last program review (see Section 2 for details). The revisions made to the mathematics major have improved efficiency in several ways. Previously, a larger number of upper division courses led to smaller class sizes as cohorts spread out between

the courses. Additionally, the previous structure included required classes that were only offered once every other year. This led to special offerings of these courses for small numbers of students who needed them to graduate. In the new structure of the mathematics major, the path to the senior-level classes is trimmer and each required course is offered at least once per year. These adjustments will create higher enrollment in courses, eliminate the need for special offerings of courses (for small numbers of students), and should aid retention as students form cohorts that continue together through the major.

Another efficiency in the mathematics program is that a significant number of 100-level mathematics and 200-level statistics courses are taught by our non-tenure-track instructors. The pay scale for instructors is lower than T/TT faculty and our instructors are effective teachers of mathematics and statistics.

5. Student Learning Outcomes and Assessments

At Colorado Mesa University, there are both institutional and departmental Student Learning Outcomes (SLOs). The university wide SLOs can be found on the CMU website and state that all CMU baccalaureate graduates are expected to be proficient in specialized knowledge/applied learning, critical thinking, communication, quantitative fluency, personal and social responsibility, and information literacy. The SLOs for the Department of Mathematics and Statistics are presented in the following section together with a course mapping.

a. Mathematics program student learning outcomes (SLOs)

Mathematics Student Learning Outcomes	MATH 240	MATH 253	MATH 225	MATH 352	MATH 452	MATH 492
Construct multi-step problem-solving strategies and communicate solutions effectively in written form. (Specialized Knowledge, Quantitative Fluency)		X	X			
Use mathematical software (including calculators) to aid in problem-solving and investigation and understand its limitations. (Applied Learning)			X			

Outcome						
Prove propositions deductively from definitions and theorems, using clear and precise prose. (Critical Thinking)	X			X	X	
Investigate, discuss, and respond to ethical and social challenges in a mathematical context. (Communication Fluency, Personal and Social Responsibility, Information Literacy)						X
Demonstrate comprehension of an advanced topic in mathematics and deliver written and oral presentations. (Specialized Knowledge, Communication Fluency, Information Literacy)						X

Applied Mathematics Student Learning Outcomes	**MATH 240**	**MATH 253**	**MATH 225**	**MATH 366**	**MATH 466**	**MATH 492**
Use methods of applied mathematics to model and solve applied problems (Specialized Knowledge, Quantitative Fluency, Applied Learning)		X		X	X	
Use mathematical software (including calculators) to aid in problem-solving and investigation and understand its limitations. (Applied Learning)			X	X	X	
Prove propositions deductively from	X					

definitions and theorems, using clear and precise prose. (Critical Thinking)						
Investigate, discuss, and respond to ethical and social challenges in a mathematical context. (Communication Fluency, Personal and Social Responsibility, Information Literacy)						X
Demonstrate comprehension of an advanced topic in applied mathematics and deliver written and oral presentations. (Specialized Knowledge, Communication Fluency, Information Literacy)						X

Mathematics Secondary Education **Student Learning Outcomes**	**MATH 240**	**MATH 253**	**MATH 225**	**MATH 352**	**MATH 380**	**MATH 492**
Construct multi-step problem-solving strategies and communicate solutions effectively in written form. (Specialized Knowledge, Quantitative Fluency)		X	X			
Use mathematical software (including calculators) to aid in problem-solving and investigation and understand its limitations. (Applied Learning)			X			
Prove propositions deductively from definitions and theorems, using clear and precise prose. (Critical Thinking)	X			X		

Investigate, discuss, and respond to ethical and social challenges in a mathematical context. (Communication Fluency, Personal and Social Responsibility, Information Literacy)						X
Demonstrate familiarity with the logical and historical development of mathematics and the implications of this development. (Specialized Knowledge)					X	
Effectively communicate mathematics using oral and written exposition appropriate for teachers of mathematics. (Specialized Knowledge, Communication Fluency, Information Literacy)						X

The following SLOs are common to all secondary education programs and are assessed by the Department of Teacher Education
- Effectively communicate mathematics using oral and written exposition appropriate for teachers of mathematics. (Communication Fluency)
- Instruct K-12 students based on self-written learning plans to address individual learning and developmental patterns in Mathematics. (Specialized Knowledge)
- Design a safe and supportive learning environment for elementary and secondary education students. (Applied Learning)
- Apply mathematics content knowledge while working with learners to access information in real world settings assuring learner mastery of the content. (Specialized Knowledge)
- Integrate assessment, planning, and instructional strategies in coordinated and engaging ways through multiple means of communication. (Critical Thinking/Communication Fluency)
- Engage in meaningful and intensive professional learning and self-renewal by regularly examining practice through ongoing study, self-reflection, and collaboration. (Applied Learning)

Statistics Student Learning Outcomes	MATH 253	STAT 301	STAT 312	MATH 492

Construct multi-step problem solving strategies and communicate solutions effectively in written form. (Specialized Knowledge/Quantitative Fluency)	X			
Use mathematical software (including calculators) to aid in problem-solving and investigation and understand its limitations. (Applied Learning)		X	X	
Apply appropriate statistical procedures and justify chosen assumptions. (Applied Learning, Personal and Social Responsibility)		X	X	
Draw statistical conclusions and evaluate the validity of others' conclusions. (Critical Thinking, Information Literacy)			X	
Investigate, discuss, and respond to ethical and social challenges in a mathematical context. (Communication Fluency, Personal and Social Responsibility, Information Literacy)				X
Demonstrate comprehension of an advanced topic in statistics and deliver written and oral presentations. (Specialized Knowledge, Communication Fluency, Information Literacy)				X

Actuarial Science **Student Learning Outcomes**	**MATH 253**	**STAT 301**	**STAT 312**	**MATH 492**
Construct multi-step problem solving strategies and communicate solutions effectively in written form. (Specialized Knowledge, Quantitative Fluency)	X			
Use statistical software (including calculators) to aid in problem-solving and investigation and understand its limitations. (Applied Learning)		X	X	
Apply appropriate statistical procedures and justify chosen assumptions. (Applied Learning, Personal and Social Responsibility)		X	X	
Draw statistical conclusions and evaluate the validity of others' conclusions. (Critical Thinking, Information Literacy)			X	

Investigate, discuss, and respond to ethical and social challenges in a mathematical context. (Communication Fluency, Personal and Social Responsibility, Information Literacy)				X
Communicate technical analyses to non-specialists (Communication Fluency)				X
Apply concepts of finance, economics, and risk management in statistical decision making. (Specialized Knowledge, Applied Learning)				X

b. **Direct and indirect metrics of assessments of SLOs**

Numerous direct and indirect measures were used to assess the program's student learning outcomes.

Assessment activity from 2014 to 2017: The assessments of the outcomes listed below were included in our 2017/2018 Three-Year Assessment Report that can be found in Appendix E. That report includes a summary of the results and the actions taken.

The outcomes
- *Construct multi-step problem-solving strategies and communicate solutions effectively in written form (Specialized Knowledge, Quantitative Fluency),* and
- *Use mathematical software (including calculators) to aid in problem-solving and investigation, and understand its limitations (Applied Learning)*

were assessed using common questions on final exams in our Calculus III (MATH 253) and Linear Algebra (MATH 352) courses.

The outcome
- *Prove propositions deductively from definitions and theorems, using clear and precise prose (Critical Thinking)*

was assessed using student homework portfolios in Introduction to Advanced Mathematics (MATH 240), Real Analysis (MATH 452) and Abstract Algebra (MATH 490) courses.

The outcome
- *Demonstrate comprehension of an advanced topic in mathematics and deliver written and oral presentations (Specialized Knowledge, Communication Fluency, Information Literacy)*

was assessed by department faculty who read student's Senior Seminar papers and/or attended final Senior Seminar presentations. Common rubrics were used.

Assessments that have occurred since our 2017/2018 Three-Year Assessment Report are included below.

Assessment activity in Fall 2018: In Fall 2018, the university-wide baccalaureate-level outcome

- *Reflect on and respond to ethical, social, civic, and/or environmental challenges at local, national, and/or global levels (Personal and Social Responsibility)*

was assessed in all Probability and Statistics (STAT 200) courses. Students were asked two multiple choice questions. Approximately 60% of all students answered the first question correctly and 42% answered the second question correctly. This was our first attempt at assessing this SLO and departmental discussions are ongoing. In particular, a personal and social responsibility project has been added to our new Senior Capstone (MATH 492) course and it is likely that our assessment of this outcome may occur in that course in the future.

Assessment activity in Spring 2018 and Spring 2019: In Spring 2018 and Spring 2019, the outcome

- *Demonstrate comprehension of an advanced topic in mathematics and deliver written and oral presentations (Specialized Knowledge, Communication Fluency, Information Literacy)*

was assessed in Senior Seminar II (MATH 494). All students majoring in mathematics or mathematics with a concentration in statistics were required to take the Senior Seminar (MATH 484/494) sequence. At the end of Senior Seminar II, each student submitted a final paper on his/her research project and gave a 20-minute oral presentation. Each final paper was assessed by the student's mentor and at least one other professor. Each final presentation was assessed by the faculty members in attendance at the presentation (typically around 5-10 faculty). From Spring 2018 through Spring 2019, 10 students completed the Senior Seminar course sequence. Of those students, 9 (90%) earned 80% or higher on their final paper and 9 (90%) earned 80% or higher on their final presentation. All faculty use a common rubric. The rubrics for the paper and presentation can be found in Appendix E.

Assessment activity in Fall 2019 and Fall 2020: Starting in Fall 2019, students majoring in mathematics from all five concentrations are required to complete our redesigned one-semester Senior Capstone (MATH 492) course. The last project of the semester is a research project that the student completes under the direction of a faculty mentor. This project culminates in a research paper as well as a 10–12-minute presentation describing the results. Each final paper is assessed by the student's mentor and at least one other professor. Each final talk is assessed by the faculty members in attendance at the presentations (typically around 10-12 faculty). In Fall 2019 and Fall 2020, there were 22 students who completed the Senior Capstone course. Of these students, 20 (90%) earned 80% or higher on their final project. The rubrics for the paper and presentation can be found in Appendix E.

Major Field Achievement Test

Prior to 2018, all students majoring in mathematics, regardless of concentration, took the Major Field Test (MFT) in mathematics during their senior year. In 2018, we stopped requiring that students concentrating in secondary education take the MFT exam since they were taking the standardized PLACE or Praxis II exam. So, in 2018 and 2019, only graduating seniors majoring in (pure) Mathematics or in Mathematics with a Concentration in Statistics took the exam. In 2020 we stopped using the MFT exam altogether.

MFT scores in mathematics range from 120 to 200. The mathematics program assessment criterion for success has been that 75% of our students score 140 or higher on the MFT exam. A score of 140 is very roughly the 20th percentile. For the years covered by this program review, 86.1% of our students scored 140 or higher. A yearly breakdown of the percentages of students scoring 140 or higher is given in the following table.

Percentage of Students Scoring 140 or Higher on the MFT by Year							
Year	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
% 140 or above	88.8%	75%	72.7%	100%	100%	100%	NA

We attribute the variations in success rates to small samples (i.e., small number of graduates). Individual student scores are reported in the table below.

MFT Scores for Colorado Mesa University Mathematics Majors							
Year	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Individual Student Scores	182	195	176	165	162	180	NA
	179	170	164	162	162	153	
	176	164	164	159	159		
	161	139	151		156		
	158		145		156		
	154		145		150		
	151		145		141		
	151		145				
	136		139				
			136				
			130				
Mean Score	160.9	167	149.1	162	155.1	166.5	

It should be noted that some students who have graduated did not take the exam due to extenuating circumstances.

From 2014-15 to 2019-20, the mean MFT score for all CMU mathematics majors is 157.25. The table below is from the 2014 Education Testing Service Comparative Data

Guide for the MFT for Mathematics. It allows us to compare our institutional means to the mean of mean scores for other institutions.

2014 Institutional Means Total Score Distribution			
Number of Institutions	Mean of Means	Median	Standard Deviation
221	155.1	154	9.3

Our overall institutional mean in 2014 (160.9) is slightly higher than the 2014 mean of means (155.1) of other institutions using the exam. We were unable to obtain the comparative data for subsequent years.

Discussion of Alumni Survey Results:
The most recent alumni survey included results from mathematics majors who graduated between 2013 and 2020. The response rate was 43.4%, which is very high according to a senior analyst at CMU's institutional research office. The total number of responses received was 36.

Among the variety of comments by survey respondents, two themes stood out: the value of their small class sizes, and praise of their professors, who were described as knowledgeable, approachable, and caring. Respondents gave a variety of answers when asked for the most helpful math/stat course, which we see as an indicator for the high quality of our program.

We found that many survey numbers compare favorably to those for the whole institution. For example, respondents
- were satisfied or very satisfied with their education at CMU (91.7%)
- often or very often had conversations with faculty outside class (80.6%)
- would probably or definitely recommend CMU (80.5%)

The first two percentages are higher than the corresponding survey percentages for all CMU graduates. Our program also received higher than average effectiveness ratings in most of the associate and baccalaureate learning outcomes.

A large percentage of students (83.9%) feel at least adequately prepared for their current career, and most reported salaries are between $40,000 and $100,000 per year. We believe this to be typical, considering that some alumni have been in the workforce for several years. About half of the respondents have enrolled in a graduate, professional or certificate program after graduation, or are planning to do so. Among those already enrolled in further educational programs, 85.7% respond that CMU prepared them at least adequately for their programs.

From the survey results we also see some possible areas for improvement.
- We received a lower rating in the student learning outcome "Reflect on and respond to ethical, social, civic, and/or environmental challenges at local, national, and/or global levels." This student learning outcome was added in 2018

and since then we have taken steps to incorporate this learning outcome into our curriculum. For example, Senior Capstone (MATH 492) includes a presentation focused on this outcome. Since both the outcome and our Senior Capstone course were introduced relatively recently, we expect ratings for this outcome to improve in the future.

- Only 63.6% of respondents report that they have a job related to their field of study. While lower than the CMU average, this number does not fully surprise us, since a mathematics degree prepares students for a wide range of careers requiring a broad variety of skills, as confirmed by several alumni comments in this survey.

When prompted for suggestions to improve the mathematics program at CMU, alumni responses included three themes.

- Internship/partnership opportunities for career placement and career advising
- More programming in the curriculum (in particular: learning Python, and statistical languages other than R)
- More consistent grading across faculty

We will examine the suggestions to be proactive and prepare our students for the changing demands of the future. Detailed results of the alumni survey can be found in Appendix E.

c. **Program improvements resulting from assessments of SLOs since the previous program review**

The math/stat program has undergone multiple changes since the last program review. Some of those changes were a result of recommendations from our previous external reviewer (see Section 1c), some were department initiated (see Section 2c), some were related to assessments of SLOs (see the 2017-18 Three-Year Assessment Report that can be found in Appendix E) and some were a result of other factors.

There is a statewide mandate to reduce the number of students going into developmental courses. To facilitate that mandate, the Office of Developmental Education modified the developmental mathematics program by creating the course Foundations of Algebra (MATC 092), which consolidates material from two previous (sequential) developmental courses to accelerate students' readiness for college level mathematics. CMU has also started using the ALEKS Placement, Preparation, and Learning (ALEKS PPL) for placement. The assessment generates an individualized Prep and Learning Module that allow students to brush up on topics that may have been forgotten or haven't been practiced for some time. Once the Prep and Learning Module has been completed, students are allowed to take the placement assessment again. Properly used, this placement methodology allows students who previously would have been enrolled in developmental courses to potentially place into a college-level mathematics course.

With fewer students utilizing developmental courses and instead enrolling in college-level mathematics, it was necessary to review and revise our College Mathematics (MATH 110) course. Dr. Tracii Friedman, was given a course release in Spring 2020,

which she used to attend a variety of national and regional conferences as well as to consult with other departments on campus to solicit input for what was considered most important that students gain from the course. The content, materials, and learning outcomes were redesigned to achieve these goals, and the course is now project based, active, and much more relevant to the students' majors and interests. These projects were also heavily influenced by our assessment goals and the essential learning outcomes that we must meet as a department. The course has been renamed Mathematical Investigations.

Our College Algebra (MATH 113) course, is currently being reviewed.

d. Refinements of SLOs and associated assessments and metrics

One of the primary goals of the mathematics and statistics programs is to refine our program SLOs and our course SLOs. More detail can be found in Section 6.

e. Other assessments utilized by the program

Students pursuing teaching licensure, either elementary or secondary, must take the standardized PLACE (secondary only) or Praxis II exam. Elementary education students take a multi-subject elementary education exam, whereas the secondary education students take a content-specific mathematics exam. The Praxis II exam is accepted by many states, but the PLACE exam is specific to Colorado and was discontinued in mid-2017. Over the period of this review, there have been changes in the tests and bases for passing them. Prior to the fall of 2016, elementary education majors had to reach a single cut score for the aggregate Praxis test. After that date, students must surpass cut scores in four separate subject areas on the test.

Both Praxis II and PLACE scores are available for the mathematics majors who concentrated in secondary education from Fall 2014 through Spring 2020. All 12 students who took the test passed.

The 40 Elementary Education majors who concentrated in mathematics took one of the Praxis II tests. Of the 14 who needed to pass with a single aggregate score, one student only achieved a score of 158 relative to the passing score of 163. However, that student retook the test later and exceeded the cut score. In addition, that student scored 33 out of 36 on the mathematics subtest, so mathematics proficiency was clearly not the issue. All 26 of the remaining students who had cut scores for separate subjects easily reached the required score of 157 on the mathematics subtest, with an average score of 187. That result is not surprising: mathematics concentrators should score quite well on the mathematics portion of a test designed to measure competency across all elementary subject areas, regardless of declared concentration.

All students majoring in the Liberal Arts: Elementary Education option must take the three-course sequence of MATH 105, 205, and 301. To be state certified, they must take the Praxis II test, which has a mathematics subsection discussed here. We have data on attempt and pass rates for these students during the period Sept. 2015 through Aug. 2018.

Of the 103 students making a first attempt, 77.1% passed. This rate ranked CMU 7th out of 32 Colorado programs that had sufficient numbers to report (more than 5). Of the failing students, 14 made a second attempt, 1 made a third attempt, and 3 made four or more attempts. Only 4 students "walked away" after the first attempt and did not attempt further. For the best attempt reported, 95 of the 103 students passed, for an ultimate pass rate of 92.2%. This result ranked CMU 4th out of the 32 Colorado programs, and indeed, the second-ranked school was only 0.7% higher at 92.9%. Particularly considering these measures are relative to many programs that are much more selective and/or have lower Pell Grant percentages, the CMU elementary education math content sequence appears to be very effective.

6. **Future Program Plans**

   a. **Vision for the mathematics program**

   To complement our Mission Statement in Section 1d, we have a defined vision statement:

   > *The Mathematics and Statistics Faculty at Colorado Mesa University aspire to provide an excellent undergraduate education in mathematics by challenging all students to actively engage in the study of mathematics and its applications and in so doing advance their problem solving and critical thinking skills.*

   b. **Strengths and challenges facing the program**

   Program strengths:
   A key strength of our program continues to be found in the curriculum we offer and in our ability to adapt our curriculum based on current research of best practices in the discipline and on student demand. In our last program review, we identified several such curricular improvements that we planned to make--we accomplished most of those as well as several others discussed throughout this report and summarized below.

   First, we added two new concentrations to our major: one in applied mathematics and one in actuarial science. The addition of a concentration in applied mathematics provides our students with the opportunity to obtain the background required to fill an ever-growing need in industry. This concentration has expanded quickly. The actuarial science concentration was specifically requested by the University President to fill a growing demand for this coursework.

   In addition to these new undergraduate concentrations, we also developed a graduate certificate program in applied mathematics. This program is designed specifically for teachers wanting to obtain the required 18 graduate-level content hours to meet the HLC requirement for teaching college mathematics courses in high school or at the university. For those without a master's degree, the certificate can be paired with CMU's Master of Arts in Education degree.

Two significant improvements to our course offerings include the addition of a freshman orientation to the major and a redesign of our senior capstone course. The one-credit Topics and Careers in Mathematics (MATH 150) course described in Section 1.c. introduces students to our major in several ways. Many of the topics are introduced by guest instructors so that the students meet several different faculty over the course of the semester. Students also receive general advising and have the opportunity to visit with upper-level math majors and alumni. This course provides an amazing introduction to our program and to what the student can accomplish with a mathematics degree. It has also been successful at generating cohorts of students who proceed through the challenging upper-level concentration courses together.

The new Senior Capstone (MATH 492) course is also described in Section 1.c. The course is a complete redesign of the former two-course sequence, structured to meet the following goals:
- Include students from all five of our mathematics concentrations.
- Include a social justice component, in part to address the new institutional baccalaureate Personal and Social Responsibility learning outcome. This is accomplished through a project in which students describe a social challenge in our world from a mathematics perspective. The project is directed to a general audience and the presentations are open to the public.
- Respond to the changing set of skills of our students. For example, even before the introduction of the MATH 150 course, students often had experience with LaTeX and other technology before reaching the capstone sequence and thus no longer needing the instruction there.
- Maintain a one-on-one faculty/student mentoring component. This is accomplished in our final research project which encompasses the last 8 weeks of the semester.
- Assess multiple means of communication. Students give three oral presentations to a variety of defined audiences, produce written reports of various styles, and create a conference-style poster.
- Address scheduling issues. Instead of a two-semester sequence (2 credits each), the course is now a one-semester (3 credit) course. CMU established a December Commencement in Fall 2014 and a one-semester course accommodates both fall and spring graduates whereas the year-long sequence often required us to run both courses in our capstone sequence each semester to meet the needs of graduating students.

The mathematics program has a dedicated and experienced group of faculty members who make teaching their first priority. All faculty members who teach upper-level courses have earned Ph.D.'s. We work with students to build relationships and to foster a strong sense of community within our program.

Indeed, the relationships that develop between faculty and students and also among our students are strong. We hold advising lunches for our majors in which they come not only for scheduling advice, but to hang out and chat with faculty; the camaraderie and support that we see our students provide each other is inspiring. We have an exciting and active

math club that includes students from across the concentrations and even outside of the major. Math Club has been invaluable in promoting mathematics as an area of study. Some of the Math Club activities include hosting frequent social events, volunteer tutoring in the dorms, and organization and execution of Math Extravaganza! This latter project is an annual event on campus which draws approximately 150 students from regional high schools for a day of learning interesting mathematics through hands-on activities. The event serves as a recruitment tool for both the university and the mathematics program. Additionally, the Math Club raises money through a variety of fundraisers held during the year which can be used to provide funding for students to attend conferences and present their research.

The Mathematics Honor Society, Kappa Mu Epsilon, also draws its membership from many different majors with approximately 8-10 new inductees each year. Typically, about 5-10 mathematics students participate in the annual Student Showcase held at Colorado Mesa University each spring. Additionally, there are opportunities within our department for our students to serve as study group leaders and tutors. These opportunities are especially important for future teachers and for students planning to seek graduate teaching assistant positions.

In order to build more interaction among math faculty in regard to pedagogy, we have started a program of regular departmental professional development that includes Communities of Practice. While the pandemic has put a damper on what was an enthusiastic start to these events, we fully expect to ramp this endeavor back up again in the coming months.

Trends in the discipline that may impact the program

Our program, courses, and pedagogy are largely influenced by recommendations from national professional mathematics organizations, pedagogical research, and trends in the discipline.

For example, in Fall 2019, our department started to re-evaluate our College Mathematics (MATH 110) course that students in liberal arts programs take to satisfy their Essential Learning math requirement. Our reasons for this re-evaluation included the following.
- National studies in mathematics education that suggest better, more effective ways to improve quantitative reasoning skills in students with non-STEM majors.
- Research in cognitive science that suggests teaching strategies and support options that improve student success in entry-level, terminal college mathematics courses

After gathering feedback from all programs requiring MATH 110, and reviewing the appropriate recommendations and pedagogical research, we made substantial changes to the course over several semesters, giving the course the new title Mathematical Investigations. The redesigned course, first mentioned in Section 1.c, focuses on relevant, real-life applications of mathematical concepts. We employ a modified flipped-classroom approach with daily class activities that emphasize how the concepts would be used in the day-to-day life of the students. There are also three larger projects (in lieu of tests) in

which the students apply the content in a real way to their own lives (student loan debt; future house purchase; use of passwords, etc.).

We have started a similar process for redesigning our College Algebra (MATH 113) course that students with B.S. majors take to satisfy their Essential Learning math requirement. Currently, MATH 113 is taught using a very traditional approach that covers algebraic operations, functions, graphing, solving equations, etc. However, many students taking our MATH 113 course do not take additional math courses, making this their last exposure to formal mathematics. Thus, we are looking to reform MATH 113 so that it is a more appropriate and relevant course for students taking it as a terminal math course. Our content and pedagogy will be based on feedback from the programs which require the course, pedagogical research, recommendations from our professional mathematics organizations, and guidelines from the state.

Recent studies by several national mathematics organizations such as the MAA (Mathematical Association of America) and AMS (American Mathematical Association) have shown the importance of modeling and developing student communication skills in a college algebra course, as well as the importance of making sure students can demonstrate conceptual understanding of the topics and not only an ability to perform algebraic computations. Thus, one possibility is to teach MATH 113 using a more modeling-based approach in which students focus on real-life mathematical models with less emphasis on algebraic operations. Students in such a course would likely have time in class to discuss, learn from, and teach one another, and would be assessed on not only their ability to manipulate algebraic expressions, but on their ability to interpret and explain information and results. It is important to note that students continuing on to take higher-level mathematics courses will not take this reformed MATH 113 course. Rather, they will take a precalculus sequence that will contain the mathematical exposure needed for them to continue on to higher level mathematics. We are hoping to have a redesigned College Algebra course for our students by Fall 2022.

Also, the recently developed applied mathematics program, described above, incorporates best-practice recommendations from the Mathematical Association of America and the Society of Industrial and Applied Mathematics such as project-based learning and a focus on developing communication, modeling, and technology skills.

Finally, as data science is a trending interdisciplinary field, faculty are working with CMU's Computer Science program to develop a Professional Certificate in Data Science. The coursework will include an equal selection of current mathematics and statistics courses alongside the computer science requirements.

How the program review process is being used to improve the program's teaching and student learning

As we have worked our way through this program review process, we have taken the opportunity to consider our current population of students as well as current trends in mathematics, including statistics and mathematics education, some of which is described

above. With the recent changes we have made, we find that our program is working very well. That said, we find there are a few changes we believe would strengthen our program and better position our students for success in the current career climate. Those changes include:

- Updating and improving our Student Learning Outcomes, both at the course and program levels
- Addressing and refining procedures for assessment of program student learning outcomes for each concentration
- Investigating opportunities for internship partnerships in the local community, particularly for our students concentrating in applied mathematics and actuarial science
- Promoting elementary and secondary education and investigating funding opportunities for future teachers
- Exploring the possibility of creating a sophomore or junior seminar in mathematics to serve as a bridge between our freshman seminar and senior capstone courses
- Facilitating regular professional development opportunities and mentoring relationships for all faculty

In addition to these possible program improvements, a big focus of our attention in the next few years will be to make substantial revisions to our first-year courses, as outlined above.

Program's challenges and potential resources needed to address them

While we are pleased with the growth of our program and the very positive outcomes of the curricular improvements we have made in the last several years, there remain some challenges.

First, in the process of this program review (as noted above), we recognize that our student learning outcomes, especially at the course level, are in critical need of updating and improvement. Revisiting our program level student learning outcomes should also happen regularly to ensure that they reflect our efforts to stay current in pedagogy and course offerings. In designing the new MATH 110 course, we found that having strong learning outcomes for statewide-transfer courses and for Essential Learning courses enabled us to create a very focused set of course goals that mapped tightly to those programs' outcomes. This process makes it easy to convey to faculty teaching the course what we wish to accomplish in the course.

Second, our cycle for assessing our concentrations through the program student learning outcomes has been disrupted due to faculty turnover. A defined and detailed process and a multi-member subcommittee (possibly of the Math Program Working Group) are needed, along with a central and accessible location for all (digital) assessment artifacts, to ensure the continuation of the assessment cycles through departmental changes.

Staying current and consistent with assessment is necessary to help inform our future course and program modifications.

We note that student enrollment in our secondary education program has been low. While we recognize this issue as a national trend, in part due to poor compensation for teachers in combination with large workloads, we do believe that there are some things we could do to attract more students to this concentration. We plan to help ensure that qualified faculty with experience in a high school classroom are available to teach the Methods of Secondary Mathematics (EDUC 497C) course. We will also focus efforts to promote the program through accurate information and data about teaching in STEM fields and will seek ways to better engage our secondary education majors in activities such as Math Club, tutoring, Math Extravaganza, and our GirlsDoMath summer camp. With our current Math Education faculty member retiring this year, it is crucial that our replacement request be granted and that we have a successful search.

The number of faculty members with a Ph.D. in mathematics or statistics meets the demand for course offerings at the calculus or higher level, but it is inadequate to simultaneously cover the number of sections of College Algebra (MATH 113), Mathematical Investigations (MATH 110), Precalculus (MATH 119), and Probability and Statistics (STAT 200) needed each semester. As a result, most sections of those courses are taught by non-tenure-track faculty. These instructors are often new to teaching at the college-level and typically do not teach higher-level courses. Determining which topics to emphasize, appropriate assessments, and other course details can be challenging for instructors who do not teach the subsequent coursework and can result in inconsistency across different sections of the same course. The Department Head observes the teaching of every faculty member during the fall semesters, and while this is a valuable exercise, it often does not reveal the concerns related to course inconsistencies. Also, it is a time-consuming process, making it difficult to schedule follow-up discussions or to have sustained conversations about teaching with individual faculty members. Department-wide reciprocal mentoring and professional development programs is one way to help address concerns and provide continued efforts toward improving teaching effectiveness, if participants are willing.

Finally, as noted earlier, we have found that our Essential Learning mathematics courses are, in general, quite outdated. While we have already redesigned our non-STEM course, there is much work to be done in redesigning our college algebra, trigonometry, precalculus, and introductory statistics courses. A necessary resource to accomplish a complete and successful redesign of our first-year courses are separate course coordinators or one coordinator of Essential Learning mathematics.

There are many aspects to the successful redesign of courses that rely on or would benefit from having a coordinator(s). These include ensuring course comparability across sections (including concurrent high school sections); providing professional development for faculty, especially those less comfortable with active learning strategies; observing classes and evaluating faculty; addressing student concerns; creating general course guidelines and content schedules; creating weekly content pacing guides and learning

objectives; and developing course activities and assessments available for use by faculty teaching the courses.

Many of the items in the above list arose as challenges during the implementation of the MATH 110 redesign. As part of that redesign, we received approval from Academic Affairs for a two-credit release per semester on a year-by-year basis. The release time was for a faculty member to initially develop the course and then to (unofficially) coordinate the course. While this release time is valued and appreciated, it does not sufficiently supply the time required to meet weekly with instructors and to address the complete list above. As we continue the process to redesign our introductory level courses, it becomes imperative that a more formal and permanent position be created with sufficient release time.

In summary, the main resource necessary to accomplish the goals and address the challenges of the program is time. As faculty continue to invest more of their time in other teaching and service-related duties, little time is available for program review and revisions.

How the program plans to continue engaging students from a diversity of backgrounds, including those from underserved and/or underrepresented groups (e.g., via curriculum, presentations, clubs, mentoring, etc.)

While we will continue in the efforts toward engaging diverse audiences described in Section 1.g., we recognize that the two largest mathematics organizations, Mathematical Association of America (MAA) and American Mathematical Society (AMS), have made the issues of diversity, equity, and inclusion their primary focus. As such, there is substantial programming (lectures, workshops, etc.) currently offered by these organizations as well as conversations in officers' meetings centered on these important topics. Some members of our mathematics faculty have already participated in such conversations and/or programming. We believe that centering a Community of Practice on this topic could benefit our students.

Many of our courses, ranging from MATH 110 through to our Senior Capstone course, are taught using a more active pedagogical style (such as flipped, modified flipped, and/or problem-based). Current research in mathematics education suggests that these active classroom approaches can help to engage students from a variety of different backgrounds, leading to greater rates of success for all student groups.

Our math club provides a welcoming and friendly environment for all students. Our membership includes many women (an underrepresented group in STEM fields) as well as members from diverse socio-economic and ethnic backgrounds. To further engage our majors, we will take advantage of newly discovered remote delivery options (e.g. Zoom) to host colleagues of diverse backgrounds for virtual colloquia.

7. COVID Response Program Review 2021-2022

In response to the start of the COVID-19 pandemic in March 2020, Colorado Mesa University switched to remote teaching and learning for the remainder of the semester. During the 2020-2021 academic year, courses at CMU were delivered online, as hybrid/hyflex, and in-person with distancing and mask-wearing in the classroom. In addition, all courses during both semesters were remote for the last regular week of the semester and for finals week.

Course and Program Delivery, Assessment, and Training

Spring 2020:
At the time of the transition to remote delivery, the university acquired an institution-wide Zoom license and highlighted the availability of Microsoft Teams. Courses were taught via synchronous or asynchronous online delivery or some combination of both. Most upper division courses were small enough to have an effective and interactive synchronous format.

Faculty were encouraged to adopt policies that would accommodate students dealing with various issues as a result of the sudden move to online (i.e. poor internet connection, altered schedules, and additional responsibilities). In order to ensure some consistency across sections, we established common final exam policies for introductory-level courses. For example, all Calculus I, II, and III courses created take-home final exams while College Algebra and College Math courses gave online final exams with written work for each problem submitted, to be reviewed only in cases of suspected dishonesty.

During the week of prep time before the transition to online, departmental discussion posts and online meetings were facilitated to introduce faculty to technology resources available for remote teaching including outside resources such as applications for screencasting, sharable white boards, etc. Faculty shared their expertise and provided recommendations and tips on their favorite technology tools. The Department of Mathematics and Statistics ordered personal document cameras, stylus pens, and drawing tablet mousepads to aid faculty in capturing written math while using home computers for remote instruction.

Summer 2020:
CMU offered twice-weekly training sessions throughout the summer via the Office of Distance Education. The webinar series ran for eight weeks and addressed both technology and pedagogy related to remote and hybrid teaching. Participants learned and shared many useful strategies for using D2L (our learning management system) and other technologies and software, including recording lectures in the classroom with Panopto. Departmental online discussions and virtual meetings also continued throughout the summer for those faculty wishing to prepare early for the uncertainty of the fall semester. Near the start of the semester, the department hosted trial sessions in classrooms to test out the technology and various audio and video recording settings.

With fall classes already filled to capacity and classrooms restricted to 50% capacity, efforts were made throughout the summer to move courses into the limited number of large classrooms on campus in order to allow for more fully in-person classes. Before the start of fall,

arrangements were made so that 54% of mathematics and statistics classes could be delivered fully in-person.

Fall 2020:
One member in the Department of Mathematics and Statistics elected to teach fully online. All other courses were taught in a hybrid/hyflex format or fully in-person. The hybrid/hyflex model was necessitated because classroom capacities were set to 50%. These classes, primarily lower-division courses, were taught by meeting in-person with half the students at one time and alternating the in-person groups either by day or within the same class period. In 50 of our 92 classes on the main campus, faculty were able meet in-person with the entire class at the same time. Of the remaining classes, 33 sections (36%) were taught in the hybrid/hyflex format, 4 were synchronous online, and 5 were asynchronous online (as originally scheduled).
With a planned remote finals week, some common policies were developed to maintain course comparability in College Algebra (MATH 113); the comprehensive final exam was replaced with a final project along with cumulative chapter exams throughout the semester. In other courses, faculty used careful planning and altered assessment types to address or eliminate concerns about academic dishonesty on final exams.
The department purchased enough dry erase laminated 8.5" x 11" sheets along with markers and felt for every student enrolled in a mathematics course. Faculty had the option to distribute these to their students to help facilitate in-class communication and collaboration among students and with the instructor while distanced and wearing masks in the classroom. CMU purchased microphones for faculty use in the classroom.

Spring 2021:
With approval from Academic Affairs, mathematics and statistics courses were scheduled with reduced course caps so that most courses could be delivered fully in-person. Only eight sections of introductory statistics courses were taught in the hybrid/hyflex model. Many of the adaptations for Fall 2020 remained for Spring 2021.

Student challenges
Even with fully in-person courses, students struggled to keep track of requirements and deadlines. Attendance, class participation, and student engagement suffered mightily throughout 2020-2021. However, it is important to remember that while our classes were delivered in-person, students were dealing with schedules that included online and hybrid/hyflex courses as well. At-home internet connectivity was an issue for some students and faculty alike.

Lessons learned from COVID that may positively impact the program going forward.
With the technology tools and accessibility to remote delivery options, we have made changes in many aspects of our daily work. Opportunities and experiences that were once out of reach are now accessible. For example, we were able to successfully host a Mathematics Colloquium with guest speaker last spring at no cost to either the institution or the speaker. Faculty have used Zoom to host a remote class session rather than cancel when a child is home sick and faculty and staff can attend virtual meetings at times they would not otherwise be able to attend in person.

More generally, we see that faculty have the knowledge, skills, and tools necessary to be accommodating to student needs in ways that previously were not possible.

APPENDIX A

Program Sheets

Mathematics (BS)
Degree: Bachelor of Science Major: Mathematics
Program Code: 3424

About This Major . . .

Mathematics majors get jobs in a wide variety of areas. Our graduates have worked for local businesses, have run their own businesses, and have worked for scientific companies. Other graduates have continued their educations by attending graduate school (in mathematics, computer science and engineering), law school, medical school, and veterinary school.

For more information on what you can do with this major, visit Career Services' *What to Do with a Major?* resource and the Mathematics website.

All CMU baccalaureate graduates are expected to demonstrate proficiency in specialized knowledge/applied learning, quantitative fluency, communication fluency, critical thinking, personal and social responsibility, and information literacy. In addition to these campus-wide student learning outcomes, graduates of this major will be able to:
1. Construct multi-step problem-solving strategies and communicate solutions effectively in written form. (Specialized Knowledge, Quantitative Fluency)
2. Use mathematical software (including calculators) to aid in problem-solving and investigation, and understand its limitations. (Applied Learning)
3. Prove propositions deductively from definitions and theorems, using clear and precise prose. (Critical Thinking)
4. Investigate, discuss, and respond to ethical and social challenges in a mathematical context. (Communication Fluency, Personal and Social Responsibility, Information Literacy)
5. Demonstrate comprehension of an advanced topic in mathematics and deliver written and oral presentations. (Specialized Knowledge, Communication Fluency, Information Literacy)

Institutional Degree Requirements
The following institutional degree requirements apply to all CMU baccalaureate degrees. Specific programs may have different requirements that must be met in addition to institutional requirements.
- 120 semester hours minimum
- Students must complete a minimum of 30 of the last 60 hours of credit at CMU, with at least 15 semester hours in major disciple courses numbered 300 or higher.
- 40 upper-division credits (an alternative credit limit applies to the Bachelor of Applied Science degree).
- 2.00 cumulative GPA or higher in all CMU coursework.
- A course may only be used to fulfill one requirement for each degree/certificate.
- No more than six semester hours of independent study courses can be used toward the degree.
- Non-traditional credit, such as advanced placement, credit by examination, credit for

- prior learning, cooperative education and internships, cannot exceed 30 semester credit hours for a baccalaureate degree. A maximum of 15 of the 30 credits may be for cooperative education, internships, and practical.
- Pre-collegiate courses (usually numbered below 100) cannot be used for graduation.
- Capstone exit assessment/projects (e.g. Major Field Achievement Test) requirements are identified under Program-Specific Degree Requirements.
- The Catalog Year determines which program sheet and degree requirements a student must fulfil in order to graduate. Visit with your advisor or academic department to determine which catalog year and program requirements you should follow.
- See "Requirements for Undergraduate Degrees and Certificates" in the catalog for complete list of graduation requirements.

Essential Learning Requirements (31 semester hours)

See the current catalog for a list of courses that fulfill the requirements below. If a course is an Essential Learning option and a requirement for your major, you must use it to fulfill the major requirement and make a different selection for the Essential Learning requirement.

English*
| ENGL 111 | English Composition I – GTCO1 | 3 |
| ENGL 112 | English Composition II- GTCO2 | 3 |

Mathematics**
| MATH 151 | Calculus I- GT-MA1 | 3* |

History
| Select one History course | 3 |

Humanities
| Select on Humanities course | 3 |

Social and Behavioral Science
| Select one Social and Behavioral Science course | 3 |
| Select one Social and Behavioral Science course | 3 |

Fine Arts
| Select on Fine Arts course | 3 |

Natural Science
| Select one Natural Science course with a lab | 4 |
| Select one Natural Science course | 3 |

Total Semester Credit Hours **31**

* Must receive a grade of "C" or better and must be complete by the time the student has 60 semester hours.
**This is a 5credit course. 3 credits apply to the Essential Learning requirements and 2 credits apply to electives.

Other Lower Division Requirements
Wellness Requirement
| KINE 100 | Health and Wellness | 1 |
| KINE 1XX | Activity Course | 1 |

Essential Learning Capstone*
| ESSL 200 | Essential Speech | 1 |

| | ESSL 290 | Maverick Milestone | 3 |

Total Semester Credit Hours   **6**

* Essential Learning Capstone must be taken after completion of the Essential Learning English and Mathematics requirements, and when a student has earned between 45 and 75 hours.

Foundation Courses

| MATH 152 | Calculus II | 5 |
| STAT 200 | Probability and Statistics | 3 |

Total Semester Credit Hours   **8**

Program Specific Degree Requirements

(43-46 semester hours, must maintain a 2.5 cumulative GPA or higher in coursework in this area. At most one "D" may be used in completing major requirements.)

Core Courses

MATH 150	Topics and Careers in Mathematics	1
MATH 225	Computational Linear Algebra	3
MATH 253	Calculus III	4
MATH 492	Senior Capstone	3

Select one of the following   4

CSCI 110 &110L	Beginning Programming and Beginning Programing Lab	
CSCI 111	CS1: Foundations of Computer Science	
CSCI 130	Introduction to Engineering Computer Science	

Required Concentration Courses

MATH 240	Intro to Advanced Mathematics	4
MATH 310	Number Theory	3
MATH 352	Advanced Calculus	4
MATH 452	Intro to Real Analysis I	3
MATH 490	Abstract Algebra I	3

Total Semester Credit Hours   **31**

Concentration Electives

Select four of the following: *

MATH 260	Differential Equations	
or MATH 236	Differential Equations and Linear Algebra	
MATH 325	Linear Algebra	
MATH 360	Method of Applied Mathematics	
MATH 361	Numerical Analysis	
MATH 362	Fourier Analysis	
MATH 365	Mathematical Modeling	

MATH 366	Methods of Applied Mathematics II	
MATH 369	Discrete Structures I	
MATH 370	Discrete Structures II	
MATH 386	Geometries	
MATH 396	Topics	
or MATH 496	Topics	
MATH 420	Introduction to Topology	
MATH 430	Mathematical Logic	
MATH 450	Complex Variables	
MATH 453	Intro to Real Analysis II	
MATH 460	Advanced Linear Algebra	
MATH 466	Methods of Applied Mathematics III	
MATH 491	Abstract Algebra II	
STAT 301	Computational Statistics	
Total Semester Credit Hours		**12-15**

*At least one selected course must be at the 400-level. At most one topics course, which must be 3 semester hours, can be used as one of these four courses.

General Electives

All college level courses appearing on your final transcript, not listed above that will bring your total semester hours to 120 hours, including 40 hours of upper division hours. 29-32 semester hours, including 10-15 hours of upper division may be needed.

MATH 151	Calculus I-GT-MA1	2
Select additional electives		27-30
Total Semester Credit Hours		**29-32**

Advising Process and DegreeWorks

Documentation on the pages related to this program is intended for informational purposes to help determine what courses and associated requirements are needed to earn a degree. The suggested course sequencing outlines how students could finish degree requirements. Some courses are critical to complete in specific semesters, while others may be moved around. Meeting with an academic advisor is essential in planning courses and altering the suggested course sequencing. It is ultimately the student's responsibility to understand and fulfill the requirements for her/his intended degree(s).

DegreeWorks is an online degree audit tool available in MAVzone. It is the official record used by the Registrar's Office to evaluate progress towards a degree and determine eligibility for graduation. Students are responsible for reviewing their DegreeWorks audit on a regular basis and should discuss questions or concerns with their advisor or academic department head. Discrepancies in requirements should be reported to the Registrar's Office.

Graduation Process
Students must complete the following in the first two months of the semester prior to completing their degree requirements:

- Review their DegreeWorks audit and create a plan that outlines how unmet requirements will be met in the final semester.
- Meet with their advisor and modify their plan as needed. The advisor must approve the final plan.
- Submit the "Intent to Graduate" form to the Registrar's Office to officially declare the intended graduation date and commencement ceremony plans.
- Register for all needed courses and complete all requirements for each degree sought.

Submission deadlines and commencement details can be found at http://www.coloradomesa.edu/registrar/graduation.html.

Education: Secondary Education, Mathematics (BS)

Degree: Bachelor of Science
Major: Mathematics
Concentration: Secondary Education
Program Code:3430

About This Major . . .

The major in mathematics with a concentration in secondary education will prepare students to teach in both middle schools and in high schools. While completing this degree, students develop problem-solving and critical thinking skills and are introduced to the logical and historical development of mathematical ideas. Students also learn the professional skills in teaching methods and content necessary for secondary mathematics teachers. Nationally recommended curriculum guidelines are followed in order to ensure that graduates have the mathematical content and conceptual understanding necessary for all high school mathematics courses. Graduates from this program are in great demand both locally and statewide with the scarcity of

Important information for this program:
- 2.80 cumulative GPA or higher required in all CMU coursework.
- 2.80 cumulative GPA or higher required in coursework toward the major content area. All EDUC prefix courses must be completed with a grade of "B" or better.
- Students must pass the PRAXIS II exam in the content area prior to beginning the internship. Also, all other coursework toward the degree must be successfully completed prior to the internship.
- A grade of "C" or better must be earned in all required courses, unless otherwise stated.

For more information on what you can do with this major, visit Career Services' *What to Do with a Major?* resource and the Mathematics website.

All CMU baccalaureate graduates are expected to demonstrate proficiency in specialized knowledge/applied learning, quantitative fluency, communication fluency, critical thinking, personal and social responsibility, and information literacy. In addition to these campus-wide student learning outcomes, graduates of this major will be able to:
1. Mathematics Outcome 1: Construct multi-step problem solving strategies and communicate solutions effectively in written form. (Specialized Knowledge, Quantitative

Fluency)

2. Mathematics Outcome 2: Use mathematical software (including calculators) to aid in problem- solving and investigation, and understand its limitations. (Applied Learning)
3. Mathematics Outcome 3: Prove propositions deductively from definitions and theorems in clear and precise prose. (Critical Thinking)
4. Mathematics Outcome 4: Investigate, discuss, and respond to ethical and social challenges in a mathematical context. (Communication Fluency, Personal and Social Responsibility, Information Literacy)
5. Mathematics Outcome 5: Demonstrate familiarity with the logical and historical development of mathematics and the implications of this development. (Specialized Knowledge)
6. Mathematics Outcome 6: Effectively communicate mathematics using oral and written exposition appropriate for teachers of mathematics. (Specialized Knowledge, Communication Fluency, Information Literacy)
7. Teacher Education Outcome 1: Demonstrate mastery of major area's content knowledge and pedagogical strategies through fieldwork with learners in professional settings. (Specialized Knowledge/Applied Learning)
8. Teacher Education Outcome 2: Design and establish a safe, inclusive, and respectful learning environment for a diverse population of students. (Specialized Knowledge/Applied Learning)
9. Teacher Education Outcome 3: Plan and deliver effective instruction to students, based on research-based pedagogical practices. (Communication Literacy/Information Literacy)
10. Teacher Education Outcome 4: Collect and analyze student assessment data and use results to inform planning and instruction. (Quantitative Fluency)
11. Teacher Education Outcome 5: Demonstrate professionalism through ethical conduct, reflection, and leadership. (Personal and Social Responsibility)

Institutional Degree Requirements

The following institutional degree requirements apply to all CMU baccalaureate degrees. Specific programs may have different requirements that must be met in addition to institutional requirements.

- 120 semester hours minimum
- Students must complete a minimum of 30 of the last 60 hours of credit at CMU, with at least 15 semester hours in major disciple courses numbered 300 or higher.
- 40 upper-division credits (an alternative credit limit applies to the Bachelor of Applied Science degree).
- 2.00 cumulative GPA or higher in all CMU coursework.
- A course may only be used to fulfill one requirement for each degree/certificate.
- No more than six semester hours of independent study courses can be used toward the degree.
- Non-traditional credit, such as advanced placement, credit by examination, credit for prior learning, cooperative education and internships, cannot exceed 30 semester credit hours for a baccalaureate degree. A maximum of 15 of the 30 credits may be for cooperative education, internships, and practical.

- Pre-collegiate courses (usually numbered below 100) cannot be used for graduation.
- Capstone exit assessment/projects (e.g. Major Field Achievement Test) requirements are identified under Program-Specific Degree Requirements.
- The Catalog Year determines which program sheet and degree requirements a student must fulfil in order to graduate. Visit with your advisor or academic department to determine which catalog year and program requirements you should follow.
- See "Requirements for Undergraduate Degrees and Certificates" in the catalog for complete list of graduation requirements.

Specific to this Degree
- 2.80 cumulative GPA or higher required in all CMU coursework.

Essential Learning Requirements (31 semester hours, must pass all courses with a "C" or higher unless otherwise noted.)

See the current catalog for a list of courses that fulfill the requirements below. If a course is an Essential Learning option and a requirement for your major, you must use it to fulfill the major requirement and make a different selection for the Essential Learning requirement.

English*
| ENGL 111 | English Composition I – GTCO1 | 3 |
| ENGL 112 | English Composition II- GTCO2 | 3 |

Mathematics**
| MATH 119~ | Precalculus I- GT-MA1 (or higher) | 3 |

History
| Select one History course | | 3 |

Humanities
| Select on Humanities course | | 3 |

Social and Behavioral Science
| PSYC 233~~ | Human Growth and Development-GTSS3 | 3 |
| Select one Social and Behavioral Science course[+] | | 3 |

Fine Arts
| Select on Fine Arts course | | 3 |

Natural Science[++]
| Select one Natural Science course with a lab | | 4 |
| Select one Natural Science course | | 3 |

Total Semester Credit Hours   **31**

*Must receive a grade of "B" or better and must be completed by the time the student has 60 semester hours.

**Must receive a grade of "C" or better, must be completed by the time the student has 60 semester hours.

~This is a 5-semester credit hour course. 3 credits apply to the Essential Learning requirements and 2 credits apply to elective credit.

~~Must receive a grade of "B" or higher.

[+]GEOG 103 - World Regional Geography (3) recommended.

[++]One course must include a lab.

Other Lower Division Requirements

Must pass all courses with a grade of "C" or higher, unless otherwise noted.

    Wellness Requirement

KINE 100	Health and Wellness	1
KINE 1XX	Activity Course	1

    Essential Learning Capstone*

ESSL 200	Essential Speech	1
ESSL 290	Maverick Milestone	3

    Total Semester Credit Hours   6

*Essential Learning Capstone must be taken after completion of the Essential Learning English and Mathematics requirements, and when a student has earned between 45 and 75 hours.

Foundation Courses

(8 semester hours, must pass all courses with a grade of "C" or higher.)

MATH 151	Calculus I1	5
STAT 200	Probability and Statistics	3

    Total Semester Credit Hours   8

Program Specific Degree Requirements

(43-44 semester hours, must pass all courses with a grade of "C" or higher, excepting one "D", at most, which may be used in completing the major requirements. Must also maintain a 2.8 cumulative GPA or higher in coursework toward the major content area.)

Students must take the PRAXIS II exam in the content area prior to beginning the internship. Also, all other coursework toward the degree must be successfully completed prior to the internship.

    Core Courses

MATH 150	Topics and Careers in Mathematics	1
MATH 152	Calculus II	5
MATH 225	Computational Linear Algebra	3
MATH 253	Calculus III	4
MATH 492	Senior Capstone	3

Select one of the following   4

CSCI 110	Beginning Programming	
&110L	and Beginning Programing Lab	
CSCI 111	CS1: Foundations of Computer Science	
CSCI 130	Introduction to Engineering Computer Science	

Concentration Courses

MATH 240	Intro to Advanced Mathematics	4

MATH 310	Number Theory	3
MATH 352	Advanced Calculus	4
MATH 369	Discrete Structures	3
MATH 380	History of Mathematics	3
MATH 386	Geometries	3

Concentration Electives

Select one of the following   3-4

MATH 361	Numerical Analysis
MATH 365	Mathematical Modeling
MATH 450	Complex Variables
MATH 490	Abstract Algebra I
STAT 301	Computational Statistics

Total Semester Credit Hours   **43-44**

Secondary Education Requirements
(29 semester hours, all EDUC prefix courses must be completed with a grade of "B" or better.)

Program Requirements: ENGL 111, ENGL 112, PSYC 233, EDUC 115 and EDUC 215 (all with a grade of B or better) and formal acceptance to the Teacher Education Program.

APPENDIX B

Department Data and Expenditures

Department of Mathematics and Statistics

Departmental Data Report, 2014-15 through 2018-19

Prepared August 2019

by the Office of Institutional Research and Decision Support

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Mathematics and Statistics Departmental Data, 2014-15 through 2018-19

Majors

			2014-15		2015-16		2016-17		2017-18		2018-19	
			1st Major	All	1st Major	All	1st Major	All	1st Major	All	1st Major	All
Liberal Arts												
AS	Mathematics	2425	5	8	6	8	5	6	4	8	2	6
BA	Elementary Education - Math	3491	18	18	21	21	26	26	21	21	24	24
	Pre-Elementary Ed - Math	3200	33	33	26	26	27	28	26	26	13	13
PB	Pre-Elementary Ed - Math Prov Bacc	2991	2	2	2	2	1	1	1	1		
Subtotal			**58**	**61**	**55**	**57**	**59**	**61**	**52**	**56**	**39**	**43**
Mathematics												
BS	Applied Mathematics	3437							3	6	5	8
	Mathematics	3424	30	41	29	37	30	36	21	25	21	25
	Pre-Secondary Education	3402	23	23	21	22	18	18	17	17	15	15
	Secondary Education	3430	11	12	6	6	4	5	5	5	4	4
	Statistics	3434	12	14	10	11	15	15	16	17	16	17
Grad Cert	Applied Mathematics	7441							4	4	4	4
PB	Mathematics Prov Bacc	2942	1	1	1	1	1	1	2	2	2	2
Subtotal			**77**	**91**	**67**	**77**	**68**	**75**	**68**	**76**	**67**	**75**
Undeclared												
AS	Liberal Arts-Undeclared NatSc/Math	2490	9	9	6	6	3	3	1	1		
Subtotal			**9**	**9**	**6**	**6**	**3**	**3**	**1**	**1**		
Mathematics and Statistics Total			**144**	**161**	**128**	**140**	**130**	**139**	**121**	**133**	**106**	**118**

Mathematics and Statistics Departmental Data, 2014-15 through 2018-19												
Degrees Awarded												
			2014-15		2015-16		2016-17		2017-18		2018-19	
			1st Major	All	1st Major	All	1st Major	All	1st Major	All	1st Major	All
Liberal Arts												
AS	Mathematics	2425	1	1	2	2	1	1		1	2	2
BA	Elementary Education - Math	3491	4	4	4	4	10	10	5	5	9	9
Subtotal			**5**	**5**	**6**	**6**	**11**	**11**	**5**	**6**	**11**	**11**
Mathematics												
BS	Mathematics	3424	6	7	6	6	6	7	2	3	3	4
	Secondary Education	3430	2	2	6	6			2	2		
	Statistics	3434	2	2	5	5	3	3	2	2	8	8
Grad Cert	Applied Mathematics	7441									3	3
Subtotal			**10**	**11**	**17**	**17**	**9**	**10**	**6**	**7**	**14**	**15**
Mathematics and Statistics Total			**15**	**16**	**23**	**23**	**20**	**21**	**11**	**13**	**25**	**26**

Mathematics and Statistics Departmental Data, 2014-15 through 2018-19						
Minors						
		2014-15	2015-16	2016-17	2017-18	2018-19
Completed						
Mathematics	M460	7	9	3	9	14
Statistics	M465	1	1		5	1

Completed Total		**8**	**10**	**3**	**14**	**15**
Enrolled						
Mathematics	M460	22	22	26	32	32
Statistics	M465	4	5	8	9	3
Enrolled Total		**26**	**27**	**34**	**41**	**35**

Mathematics and Statistics Departmental Data, 2014-15 through 2018-19 Credit Hours by Student Level										
	2014-15		**2015-16**		**2016-17**		**2017-18**		**2018-19**	
	Enrolled	SCH	Enrolled	SCH	Enrolled	SCH	Enrolled	SCH	Enrolled	SCH
ESSL										
SO					10	30			6	18
JR					13	39			36	108
SR					5	15			15	45
ESSL Subtotal					28	84			57	171
MATH										
FR	1047	4049	1083	4219	1005	3951	727	2879	859	3300
SO	1153	4538	1264	4930	1360	5347	1280	5002	1152	4501
JR	560	2183	578	2205	591	2292	596	2292	635	2451
SR	526	1908	491	1754	455	1636	538	1927	558	1979
Grad			1	3			9	27	12	36
Non-Deg	40	164	34	146	42	170	35	149	25	103
MATH Subtotal	3326	12842	3451	13257	3453	13396	3185	12276	3241	12370
STAT										
FR	57	175	36	110	42	128	19	62	20	65
SO	389	1217	376	1177	413	1304	402	1278	400	1285

JR	322	1018	348	1125	353	1145	358	1166	340	1114
SR	185	587	248	814	239	778	261	835	259	822
Grad					1	3				
Non-Deg	2	6	1	3	2	6	2	6	7	21
STAT Subtotal	955	3003	1009	3229	1050	3364	1042	3347	1026	3307
Mathematics and Statistics Total	4281	15845	4460	16486	4531	16844	4227	15623	4324	15848

Mathematics and Statistics Departmental Data, 2014-15 through 2018-19 Credit Hours by Course Level										
	2014-15		2015-16		2016-17		2017-18		2018-19	
	Enrolled	SCH	Enrolled	SCH	Enrolled	SCH	Enrolled	SCH	Enrolled	SCH
ESSL										
200					28	84			57	171
ESSL Subtotal					28	84			57	171
MATH										
100	2800	11214	2975	11698	2983	11820	2651	10470	2661	10426
200	239	886	232	861	250	940	320	1176	328	1200
300	180	544	195	565	171	509	174	520	200	607
400	55	146	49	133	49	127	32	86	40	101
500+							8	24	12	36
Dev	52	52								
MATH Subtotal	3326	12842	3451	13257	3453	13396	3185	12276	3241	12370
STAT										
200	923	2910	971	3115	1003	3223	976	3149	955	3094
300	22	64	33	99	34	102	52	156	53	159

400	10	29	5	15	13	39	14	42	18	54
STAT Subtotal	955	3003	1009	3229	1050	3364	1042	3347	1026	3307
Mathematics and Statistics Total	4281	15845	4460	16486	4531	16844	4227	15623	4324	15848

Mathematics and Statistics Departmental Data,2014-15 through 2018-19																
Credit Hours by Course																

Subject	Course	Cr Hrs	2014-15			2015-16			2016-17			2017-18			2018-19		
			Sect	Enrolled	SCH	Sect	Enrolled	SCH	Sect	Enrolled	SCH	Sect	Enrolled	SCH	Sect	Enrolled	SCH
ESSL																	
290	Milestone	3							1	28	84				2	57	171
ESSL Subtotal									1	28	84				2	57	171
MATH																	
096	Topics	1	3	52	52												
101	Review	1				6	82	82	6	59	59	4	42	42	4	52	52
105	Elements of Mathematics I	3	5	74	222	4	72	216	4	78	234	5	89	267	5	80	240
110	College Mathematics-GTMA1	3	13	443	1329	13	422	1266	14	394	1182	12	413	1239	12	419	1257
113	College Algebra-GTMA1	4	41	1386	5544	41	1424	5696	42	1429	5716	33	1158	4632	34	1207	4828
119	Precalculus Mathematics-GTMA1	5	10	265	1325	10	312	1560	12	311	1555	13	297	1485	12	267	1335
121	Calculus for Business	3	2	53	159	2	66	198	2	63	189	2	52	156	2	47	141
130	Trigonometry	3	2	23	69	2	32	96	2	31	93	2	47	141	2	41	123
135	Engineering Calculus I	4	5	120	480	5	141	564	5	142	568	4	120	480	5	116	464
136	Engineering Calculus II	4	3	80	320	5	100	400	5	104	416	4	89	356	4	114	456

Code	Course	Cr														
141	Analytical Geometry	3	1	7	21											
146	Calculus for Bio Sci	5	2	44	220	2	60	300	2	46	230	2	17	85	2	22	110
150	Topics	1										1	12	12	1	15	15
151	Calculus I-GT-MA1	5	7	176	880	6	166	830	7	191	955	7	192	960	7	180	900
152	Calculus II	5	5	129	645	5	98	490	5	122	610	5	123	615	4	101	505
196	Topics	1							2	13	13						
205	Elements of Math II-GTMA1	3	4	62	186	4	59	177	3	49	147	3	63	189	3	68	204
225	Computational Linear Algebra	2										1	19	38	1	19	38
236	Diff Equat and Linear Algebra	4	2	56	224	2	51	204	2	61	244	3	73	292	4	89	356
240	Intro to Adv. Mathematics	4	2	28	112	2	18	72	2	24	96	2	33	132	2	21	84
253	Calculus III	4	4	85	340	4	96	384	4	105	420	4	129	516	5	125	500
260	Differential Equations	3	1	8	24	1	8	24	1	11	33	1	3	9	1	6	18
301	Math for Elementary Teachers	3	4	41	123	4	51	153	4	38	114	4	33	99	2	30	90
305	Euclidean Geometry	3	1	5	15	1	9	27	1	8	24	1	7	21	1	8	24
310	Number Theory	3	1	5	15	1	10	30	1	12	36	1	5	15	1	10	30
325	Linear Algebra	3	2	20	60	2	12	36	2	18	54	2	16	48	1	15	45
340	Ethnomathematics	3	2	3	9	2	4	12	1	1	3				1	2	6
352	Advanced Calculus	3	1	5	15	1	3	9	1	5	15	1	2	6	1	7	21
360	Methods Appl Mathematic	3	1	7	21	1	5	15	1	6	18	1	7	21	1	6	18
361	Numerical Analysis	4	1	17	68	1	9	36	1	9	36	1	12	48	1	13	52
362	Fourier Analysis	3	1	12	36	1	8	24	1	11	33	1	13	39	1	9	27
365	Mathematical Modeling	3	1	11	33	1	8	24	1	8	24	1	11	33	1	17	51
366	Methods of Applied Math II	3													1	12	36
369	Discrete Structures I	3	2	29	87	2	42	126	2	31	93	2	45	135	2	46	138

		Cr															
380	History of Mathematics	3	1	7	21	1	7	21	1	9	27	1	13	39	1	7	21
386	Geometries	4	1	7	28	1	5	20	1	5	20	1	2	8	1	10	40
389	Explorations in Math	1	1	6	6	1	13	13	1	9	9	1	8	8	1	8	8
394	Mathematics Colloquium	1	2	4	4	2	4	4									
395	Independent Study	3							1	1	3						
396	Topics	3				1	5	15									
397	Structured Research	3	1	1	3												
415	Abstract Algebra Sec Ed	3				1	2	6				1	1	3			
420	Introduction to Topology	3							1	2	6						
430	Mathematical Logic	3				1	5	15				1	4	12			
450	Complex Variables	3	1	5	15	1	4	12				1	2	6			
452	Intro to Real Analysis I	3				2	21	63				2	13	39			
453	Intro to Real Analysis II	3				1	3	9				1	2	6			
460	Advanced Linear Algebra	3	1	4	12				1	2	6				1	6	18
484	Senior Seminar I	2	1	11	22	2	9	18	2	9	18	2	6	12	1	9	18
490	Abstract Algebra I	3	2	18	54				2	17	51				2	12	36
491	Abstract Algebra II	3	1	9	27				1	8	24				1	3	9
494	Senior Seminar II	2	1	8	16	2	5	10	2	11	22	2	4	8	2	10	20
510	Applied Probability & Stats	3										1	4	12			
520	Applied Numerical Methods	3										1	4	12			
560	Applied Number Theory	3													1	6	18
570	Applied Cryptography	3													1	6	18
MATH Subtotal			142	3326	12842	147	3451	13257	149	3453	13396	138	3185	12276	136	3241	12370
STAT																	

200	Prob and Statistics-GTMA1	3	20	782	2346	17	716	2148	17	706	2118	15	661	1983	15	600	1800
215	Statistics for Soc/Behav Sci	4	4	141	564	6	202	808	6	214	856	7	221	884	8	229	916
241	Intro to Business Analysis	3				3	53	159	4	83	249	4	94	282	5	126	378
305	Stats & Quality Control	3	1	1	3	1	5	15	1	10	30	1	15	45	1	22	66
311	Statistical Methods	3	1	8	24	1	12	36	1	6	18	1	10	30	1	9	27
313	Sampling Techniques	3	1	6	18	1	8	24	1	12	36	1	13	39	1	4	12
350	Mathematical Statistics I	3	1	3	9	1	4	12	1	4	12	1	7	21	1	5	15
351	Mathematical Statistics II	3	1	3	9	1	4	12	1	2	6	1	7	21	1	4	12
395	Independent Study	1	1	1	1												
396	Topics	3													1	9	27
412	Correlation and Regression	3	1	4	12	1	3	9	1	7	21	1	7	21	1	7	21
425	Design/Analysis Experiments	3	1	5	15	1	2	6	1	6	18	1	7	21	1	5	15
495	Independent Study	2	1	1	2												
496	Topics	3													1	6	18
STAT Subtotal			33	955	3003	33	1009	3229	34	1050	3364	33	1042	3347	37	1026	3307
Mathematics and Statistics Total			175	4281	15845	180	4460	16486	184	4531	16844	171	4227	15623	175	4324	15848

Mathematics and Statistics Departmental Data, 2014-15 through 2018-19								
Credit Hours by Major								
		2015-16		2016-17		2017-18		2018-19	
		Enrolled	SCH	Enrolled		Enrolled	SCH	Enrolled	SCH
ESSL								
1. Math and Stat majors				2	6			1	3
2. Non-majors				26	78			56	168

ESSL Subtotal			28	84			57	171
MATH								
1. Math majors	141	508	164	568	147	516	176	587
2. Other Math and Stat majors	33	104	33	108	39	132	37	103
3. Non-majors	3277	12645	3256	12720	2999	11628	3028	11680
MATH Subtotal	3451	13257	3453	13396	3185	12276	3241	12370
STAT								
1. Statistics majors	16	48	17	52	34	102	42	126
2. Other Math and Stat majors	19	57	16	48	17	52	14	43
3. Non-majors	974	3124	1017	3264	991	3193	970	3138
STAT Subtotal	1009	3229	1050	3364	1042	3347	1026	3307
Mathematics and Statistics Totals								
1. Math and Stat majors	209	717	232	782	237	802	270	862
2. Non-majors	4251	15769	4299	16062	3990	14821	4054	14986
Grand Total	4460	16486	4531	16844	4227	15623	4324	15848

Mathematics and Statistics Departmental Data, 2014-15 through 2018-19																				
Credit Hours Faculty Type																				
	2014-15				2015-16				2016-17				2017-18				2018-19				
	Head CCH % cnt		SCH	SCH	CCH	SCH	SCH %	Head cnt	CCH	SCH	SCH %	Head cnt	CCH	SCH	SCH %	Head cnt	CCH	SCH	SCH %	Head cnt
ESSL																					
T/TT									3	84	100%	0					6	171	100%	0
ESSL Subtotal									3	84		0					6	171		0

MATH																				
T/TT	245	4895	38%	11	255	5488	41%	11	253	5040	38%	11	235	4575	37%	10	217	4218	34%	10
FT NonTT	201	5751	45%	8	186	5537	42%	8	189	5621	42%	6	227	6600	54%	9	229	6731	54%	9
Admin/Coach					4	160	1%	1												
PT	73	2196	17%	9	81	2072	16%	9	97	2735	20%	9	41	1101	9%	6	52	1421	11%	5
MATH Subtotal	519	12842		28	526	13257		29	539	13396		26	503	12276		25	498	12370		24
STAT																				
T/TT	62	1626	54%	2	64	1560	48%	2	36	963	29%	1	50	1382	41%	2	62	1455	44%	3
FT NonTT	20	675	22%	0	23	961	30%	0	60	1903	57%	3	47	1656	49%	2	51	1621	49%	2
PT	18	702	23%	2	18	708	22%	2	12	498	15%	2	9	309	9%	2	6	231	7%	1
STAT Subtotal	100	3003		4	105	3229		4	108	3364		6	106	3347		6	119	3307		6
Department Totals																				
T/TT	307	6521	41%	13	319	7048	43%	13	292	6087	36%	12	285	5957	38%	12	285	5844	37%	13
FT NonTT	221	6426	41%	8	209	6498	39%	8	249	7524	45%	9	274	8256	53%	11	280	8352	53%	11
Admin/Coach					4	160	1%	1												
PT	91	2898	18%	10	99	2780	17%	10	109	3233	19%	10	50	1410	9%	7	58	1652	10%	5
Grand Total	619	15845		31	631	16486		32	650	16844		31	609	15623		30	623	15848		29

Faculty headcount notes: T/TT and FT NonTT are counted once, in the primary subject in which they teach. When there are credit hours shown for a subject but the faculty headcount is 0, that means all faculty teaching in that subject also teach other subject(s) and have been recorded under the other subject.

Part-time faculty are counted once in each subject in which they teach, but are only counted once in the department total.

Mathematics and Statistics Departmental Data, 2014-15 through 2018-19

Ratio of full-time equivalent students (FTES) to full-time equivalent faculty (FTEF)

	2014-15			2015-16			2016-17			2017-18			2018-19		
	FTES	FTEF	FTES:FTEF	FTES	FTEF	FTES:FTEF	FTES	FTEF	FTES:FTEF	FTES	FTEF	FTES:FTEF	FTES	FTEF	FTES:FTEF
ESSL							2.8	0.1	22.4				5.7	0.3	22.8
MATH	428.1	21.6	19.8	441.9	21.9	20.2	446.5	22.5	19.9	409.2	21.0	19.5	412.3	20.8	19.9
STAT	100.1	4.2	24.0	107.6	4.4	24.6	112.1	4.5	24.9	111.6	4.4	25.3	110.2	5.0	22.2
Department Total	528.2	25.8	20.5	549.5	26.3	20.9	561.5	27.1	20.7	520.8	25.4	20.5	528.3	26.0	20.4

FTES- full-time equivalent student, equal to total student credit hours divided by 30 (the academic year full-time load for students) FTEF- full-time equivalent faculty, equal to total course credit hours divided by 24 (the academic year full-time load for faculty)

Mathematics and Statistics Departmental Data, 2014-15 through 2018-19

Essential Learning Courses

Subject	Course	2014-15			2015-16			2016-17			2017-18			2018-19		
		Sect	Enrolled	SCH	Sect	Enrolled	SCH	Sect	Enrolled	SCH	Sect	Enrolled	SCH	Sec	Enrolled	SCH
ESSL																
290	Milestone	3						1	28	84				2	57	171
ESSL Subtotal								1	28	84				2	57	171
MATH																
110	College Mathematics-GTMA1	3	13	443	1329	13	422	1266	14	394	1182	12	413	1239	12	419	1257
113	College Algebra-GTMA1	4	41	1386	5544	41	1424	5696	42	1429	5716	33	1158	4632	34	1207	4828
119	Precalculus Mathematics-GTMA1	5	10	265	1325	10	312	1560	12	311	1555	13	297	1485	12	267	1335
151	Calculus I-GT-MA1	5	7	176	880	6	166	830	7	191	955	7	192	960	7	180	900

205	Elements of Math II-GTMA1	3	4	62	186	4	59	177	3	49	147	3	63	189	3	68	204
	MATH Subtotal		75	2332	9264	74	2383	9529	78	2374	9555	68	2123	8505	68	2141	8524
Mathematics and Statistics Total			75	2332	9264	74	2383	9529	79	2402	9639		2123	8505	70	2198	8695

Mathematics and Statistics Departmental Data, 2014-15 through 2018-19				
Essential Learning Courses				
Last Name	**First Name**	**Category**	**Title (in Banner)**	
Berrizbeitia	Ana	T/TT	Assistant Professor of Math	
Bonan-Hamada	Catherine	T/TT	Professor of Mathematics	
Bonan-Hamada	Edward	T/TT	Associate Professor of Math	
Driskell	Lisa	T/TT	Associate Professor of Math	
Friedman	Theresa	T/TT	Professor of Math	
Gustafson	Philip	T/TT	Professor of Mathematics	
King	James	T/TT	Asst Professor of Statistics	
Miles	Eric	T/TT	Asst Professor of Mathematics	
Ott	Richard	T/TT	Assoc Prof of Statistics	
Packard	Erik	T/TT	Associate Professor of Math	
Reitenbach	Markus	T/TT	Assoc Professor of Math	
Schultz Ela	Daniel	T/TT	Assoc Professor of Math	
Wu	Zhong	T/TT	Professor of Mathematics	
Barnard	Andrea	FT NonTT	Instructor of Math	
Fischer	Marc	FT NonTT	Instructor of Mathematics	
Hillman	Heath	FT NonTT	Instructor of Math	
McFarland	Max	FT NonTT	Instructor of Math	

Mitchell	Holly	FT NonTT	Instructor of Math	
Ortiz	Marcos	FT NonTT	Instructor of Math	
Ryan	Molly	FT NonTT	Instructor of Math	
Snyder	Patrick	FT NonTT	Instructor of Math	
Stephens	Andrew	FT NonTT	Instructor of Math	
Stulc	Risharra	FT NonTT	Instructor of Math	
Ward	Wayn	FT NonTT	Instructor of Math	
Barkley	Cathy	PT	Lecturer of Math	
Bollinger	Jesse	PT	Lecturer of Math	
DeYoung	Gary	PT	Lecturer of Math	
Farrell	Cathleen	PT	Lecturer of Math	
Graus	Timothy	PT	Lecturer of Math	

Only includes faculty who are listed as primary instructor of record for a course taught in summer 2016, fall 2016, or spring 2017. Faculty who were on sabbatical or on leave for the entire year may therefore be omitted, even if they were still on the payroll.
In some cases (such as clinical instructors or teachers of applied music lessons) an instructor might not be the instructor of record for any course and might therefore be omitted from this list. Typically, this would only apply to part-time faculty.

Department of Mathematics and Statistics

Departmental Data Report, 2016-17 through 2020-21

Prepared August 2021

by the Office of Institutional Research and Decision Support

Mathematics and Statistics Departmental Data, 2016-17 through 2020-21

Majors

		2006-07		2011-12		2016-17		2017-18		2018-19		2019-20		2020-21	
		1st	All	1st	All	1st	All	1st	All	1st	All	1st	All	1st	All
Liberal Arts															
AS Mathematics	2425	8	17	7	12	5	6	4	8	2	6	4	6	4	6
BA Elementary Education – Math	3491	6	6	21	21	26	26	21	21	24	24	20	20	15	15
Pre-Elementary Ed - Math	3200			1	1	27	28	26	26	13	13	6	6	9	9
PB Pre-Elementary Ed - Math Prov Bacc	2991					1	1	1	1			2	2		
Subtotal		**14**	**23**	**29**	**34**	**59**	**61**	**52**	**56**	**39**	**43**	**32**	**34**	**28**	**30**
Mathematics															
BS Applied Mathematics												1	1	4	4
Applied Mathematics	3437							3	6	5	8	14	14	19	20
Mathematics	3424	35	49	45	57	30	36	21	25	21	25	17	21	18	23
Pre-Secondary Education	3402			12	12	18	18	17	17	15	15	9	9	16	16
Secondary Education	3430	42	44	22	29	4	5	5	5	4	4	8	8	7	7
Statistics	3434	1	4	6	12	15	15	16	17	16	17	11	11	8	9
Gr Cert Applied Mathematics	7441							4	4	4	4	6	9	6	7
PB Mathematics Prov Bacc	2942			2	2	1	1	2	2	2	2	2	2		
Statistics Prov Bacc	2943			1	1										
Subtotal		**78**	**97**	**88**	**113**	**68**	**75**	**68**	**76**	**67**	**75**	**68**	**75**	**78**	**86**
Undeclared															
AS Liberal Arts-Undeclared NatSc/Math	2490	28	35	21	22	3	3	1	1						
Subtotal		**28**	**35**	**21**	**22**	**3**	**3**	**1**	**1**						
Mathematics and Statistics Total		**120**	**155**	**138**	**169**	**130**	**139**	**121**	**133**	**106**	**118**	**100**	**109**	**106**	**116**

Mathematics and Statistics Departmental Data, 2016-17 through 2020-21

Majors

			2006-07 1st	All	2011-12 1st	All	2016-17 1st	All	2017-18 1st	All	2018-19 1st	All	2019-20 1st	All	2020-21 1st	All
Liberal Arts																
AS	Mathematics	2425	1	1	1	1	1	1	1		2	2			2	2
BA	Elementary Education - Math	3491	5	5	5	5	10	10	5	5	9	9	7	7	8	8
Subtotal			**6**	**6**	**6**	**6**	**11**	**11**	**5**	**6**	**11**	**11**	**7**	**7**	**10**	**10**
Mathematics																
BS	Applied Mathematics	3437													1	1
	Mathematics	3424	5	6	8	8	6	7	2	3	3	4	2	3	5	6
	Secondary Education	3430	3	3	1	1			2	2			3	3	3	3
	Statistics	3434					3	3	2	2	8	8	3	3	1	1
Gr Cert	Applied Mathematics	7441									3	3	1	1	4	4
Subtotal			**8**	**9**	**9**	**9**	**9**	**10**	**6**	**7**	**14**	**15**	**9**	**10**	**14**	**15**
Mathematics and Statistics Total			**14**	**15**	**15**	**15**	**20**	**21**	**11**	**13**	**25**	**26**	**16**	**17**	**24**	**25**

Mathematics and Statistics Departmental Data, 2016-17 through 2020-21

Minors

		2016-17	2017-18	2018-19	2019-20	2020-21
Completed						
Mathematics	M460	3	9	14	10	13

Statistics	M465		5	1		3
Completed Total		**3**	**14**	**15**	**10**	**16**
Enrolled						
Mathematics	M460	26	32	32	29	28
Statistics	M465	8	9	3	5	5
Enrolled Total		**34**	**41**	**35**	**34**	**33**

Mathematics and Statistics Departmental Data, 2016-17 through 2020-21															
Credit Hours by Student Level															
		2006-07		2011-12		2016-17		2017-18		2018-19		2019-20		2020-21	
		Enrolled	SCH	Enrolled	SCH	Enrolled	SCH	Enrolled	SCH	Enrolled	SCH	Enrolled	SCH	Enrolled	SCH
ESSL															
SO						10	30			6	18	3	9	5	15
JR						13	39			36	108	17	51	37	111
SR						5	15			15	45	11	33	15	45
ESSL Subtotal						28	84			57	171	31	93	57	171
MATH															
FR		672	252	1105	4368	1005	3951	727	2879	859	3300	911	3316	806	3077
SO		593	228	1005	3933	1360	5347	1280	5002	1152	4501	1265	4858	1098	4220
JR		344	126	443	1689	591	2292	596	2292	635	2451	582	2234	569	2178
SR		372	128	519	1864	455	1636	538	1927	558	1979	534	1835	481	1706
Grad		3	10					9	27	12	36	18	54	17	51
Non-Deg		83	317	38	144	42	170	35	149	25	103	58	236	50	196
MATH Subtotal		2067	768	3110	1199	3453	1339	3185	1227	3241	1237	3368	1253	3021	11428

STAT														
FR	40	120	48	148	42	128	19	62	20	65	20	65	16	48
SO	211	633	336	1034	413	1304	402	1278	400	1285	408	1309	387	1232
JR	235	705	272	867	353	1145	358	1166	340	1114	364	1183	376	1241
SR	199	597	221	692	239	778	261	835	259	822	226	725	246	787
Grad	5	15			1	3							1	3
Non-Deg	5	15	5	15	2	6	2	6	7	21	5	15	10	30
STAT Subtotal	695	208	882	2756	1050	3364	1042	3347	1026	3307	1023	3297	1036	3341
Mathematics and Statistics Total	2762	977	3992	1475	4531	1684	4227	1562	4324	1584	4422	1592	4114	14940

Mathematics and Statistics Departmental Data, 2016-17 through 2020-21														
Credit Hours by Course Level														
	2006-07		2011-12		2016-17		2017-18		2018-19		2019-20		2020-21	
	Enrolled	SCH	Enrolled	SCH	Enrolled	SCH	Enrolled	SCH	Enrolled	SCH	Enrolled	SCH	Enrolled	SCH
ESSL														
200											31	93	57	171
ESSL Subtotal											31	93	57	171
MATH														
100	1714	6622	2627	10464	2983	11820	2651	10470	2661	10426	2822	10688	2506	9688
200	132	426	208	746	250	940	320	1176	328	1200	276	1024	258	955
300	177	519	192	565	171	509	174	520	200	607	219	668	212	650
400	44	122	83	223	49	127	32	86	40	101	33	99	29	87
500+							8	24	12	36	18	54	16	48

MATH Subtotal	2067	7689	3110	11998	3453	13396	3185	12276	3241	12370	3368	12533	3021	11428
STAT														
200	686	2058	840	2630	1003	3223	976	3149	955	3094	963	3117	978	3167
300	9	27	32	96	34	102	52	156	53	159	56	168	44	132
400			10	30	13	39	14	42	18	54	4	12	14	42
STAT Subtotal	695	2085	882	2756	1050	3364	1042	3347	1026	3307	1023	3297	1036	3341
Mathematics and Statistics Total	2762	9774	3992	14754	4503	16760	4227	15623	4267	15677	4422	15923	4114	14940

Mathematics and Statistics Departmental Data, 2016-17 through 2020-21																		
Credit Hours by Course																		
			2016-17			2017-18			2018-19			2019-20			2020-21			
Subject	Course	Cr Hrs	Sect	Enrolled	SCH	Sect	Enrolled	SCH	Sect	Enrolled	SCH	Sect	Enrolled	SCH	Sect	Enrolled	SCH	
ESSL																		
290	Milestone	3										1	31	93	2	57	171	
	Milestone	3	1	28	84				3	86	258							
ESSL Subtotal			1	28	84				3	86	258	1	31	93	2	57	171	
MATH																		
101	Review for MATH 113	1	6	59	59	4	42	42	4	52	52	3	62	62	3	29	29	
105	Elements of Mathematics I	3	4	78	234	5	89	267	5	80	240	5	100	300	5	76	228	
110	College Mathematics-GTMA1	3	14	394	1182	12	413	1239	12	419	1257	13	454	1362	27	559	1677	
113	College Algebra-GTMA1	4	42	1429	5716	33	1158	4632	34	1207	4828	36	1238	4952	43	1062	4248	
119	Precalculus Mathematics-GTMA1	5	12	311	1555	13	297	1485	12	267	1335	11	268	1340	11	251	1255	
121	Calculus for Business	3	2	63	189	2	52	156	2	47	141	2	47	141	1	9	27	

Number	Name	Cr															
130	Trigonometry	3	2	31	93	2	47	141	2	41	123	2	48	144	2	47	141
135	Engineering Calculus I	4	5	142	568	4	120	480	5	116	464	4	127	508	4	94	376
136	Engineering Calculus II	4	5	104	416	4	89	356	4	114	456	4	91	364	4	96	384
146	Calculus for Bio Sci	5	2	46	230	2	17	85	2	22	110	1	12	60	1	8	40
150	Topics	1				1	12	12	1	15	15	2	32	32	2	22	22
151	Calculus I-GT-MA1	5	7	191	955	7	192	960	7	180	900	7	175	875	8	176	880
152	Calculus II	5	5	122	610	5	123	615	4	101	505	4	95	475	4	76	380
196	Topics	1	2	13	13							5	73	73	1	1	1
205	Elements of Math II-GTMA1	3	3	49	147	3	63	189	3	68	204	3	57	171	3	50	150
225	Computational Linear Algebra	3				1	19	38	1	19	38	1	15	45	1	20	60
236	Diff Equat and Linear Algebra	4	2	61	244	3	73	292	4	89	356	4	83	332	4	65	260
240	Intro to Adv. Mathematics	4	2	24	96	2	33	132	2	21	84	2	15	60	2	22	88
253	Calculus III	4	4	105	420	4	129	516	5	125	500	5	98	392	4	94	376
260	Differential Equations	3	1	11	33	1	3	9	1	6	18	1	8	24	1	7	21
301	Math for Elementary Teachers	3	4	38	114	4	33	99	2	30	90	3	34	102	2	23	69
305	Euclidean Geometry	3	1	8	24	1	7	21	1	8	24	1	6	18	1	6	18
310	Number Theory	3	1	12	36	1	5	15	1	10	30	1	7	21	1	7	21
325	Linear Algebra	3	2	18	54	2	16	48	1	15	45				1	4	12
340	Ethnomathematics	3	1	1	3				1	2	6	1	3	9			
352	Advanced Calculus	3	1	5	15	1	2	6	1	7	21	1	10	30	1	11	33
360	Methods Appl Mathematic	3	1	6	18	1	7	21	1	6	18	1	11	33	1	19	57
361	Numerical Analysis	4	1	9	36	1	12	48	1	13	52	1	22	88	1	17	68
362	Fourier Analysis	3	1	11	33	1	13	39	1	9	27	1	22	66	1	12	36
365	Mathematical Modeling	3	1	8	24	1	11	33	1	17	51	1	19	57	1	14	42
366	Methods of Applied Math II	3							1	12	36	1	8	24	1	7	21

Num	Course	Cr															
369	Discrete Structures I	3	2	31	93	2	45	135	2	46	138	2	60	180	3	70	210
380	History of Mathematics	3	1	9	27	1	13	39	1	7	21	1	7	21	1	7	21
386	Geometries	4	1	5	20	1	2	8	1	10	40	1	3	12	1	9	36
389	Explorations in Math	1	1	9	9	1	8	8	1	8	8	1	7	7	1	6	6
395	Independent Study	3	1	1	3												
415	Abstract Algebra Sec Ed	3				1	1	3									
420	Introduction to Topology	3	1	2	6										1	7	21
430	Mathematical Logic	3				1	4	12									
450	Complex Variables	3				1	2	6				1	8	24			
452	Intro to Real Analysis I	3				2	13	39				1	6	18	1	6	18
453	Intro to Real Analysis II	3				1	2	6									
460	Advanced Linear Algebra	3	1	2	6				1	6	18						
466	Methods of Applied Math III	3													1	5	15
484	Senior Seminar I	2	2	9	18	2	6	12	1	9	18						
490	Abstract Algebra I	3	2	17	51				2	12	36	1	6	18			
491	Abstract Algebra II	3	1	8	24				1	3	9						
492	Senior Capstone	3										1	13	39	1	10	30
494	Senior Seminar II	2	2	11	22	2	4	8	2	10	20						
495	Independent Study	3													1	1	3
510	Applied Probability & Stats	3				1	4	12				1	9	27			
520	Applied Numerical Methods	3				1	4	12				1	9	27			
560	Applied Number Theory	3							1	6	18				1	8	24
570	Applied Cryptography	3							1	6	18				1	8	24
MATH Subtotal			149	3453	13396	138	3185	12276	136	3241	12370	138	3368	12533	155	3021	11428
STAT																	

200	Prob and Statistics-GTMA1	3	17	706	2118	15	661	1983	15	600	1800	15	629	1887	16	648	1944
215	Statistics for Soc/Behav Sci	4	6	214	856	7	221	884	8	229	916	8	228	912	8	233	932
241	Intro to Business Analysis	3	4	83	249	4	94	282	5	126	378	5	106	318	4	97	291
301	Computational Statistics	3										1	14	42	1	11	33
305	Stats & Quality Control	3	1	10	30	1	15	45	1	22	66	1	20	60	1	22	66
311	Statistical Methods	3	1	6	18	1	10	30	1	9	27						
312	Correlation and Regression	3										1	8	24	1	11	33
313	Sampling Techniques	3	1	12	36	1	13	39	1	4	12	1	7	21			
350	Mathematical Statistics I	3	1	4	12	1	7	21	1	5	15	1	4	12			
351	Mathematical Statistics II	3	1	2	6	1	7	21	1	4	12	1	3	9			
396	Topics	3							1	9	27						
412	Correlation and Regression	3	1	7	21	1	7	21	1	7	21						
425	Design/Analysis Experiments	3	1	6	18	1	7	21	1	5	15	1	4	12	1	6	18
430	Categorical Data Analysis	3													1	8	24
496	Topics	3							1	6	18						
STAT Subtotal			34	1050	3364	33	1042	3347	37	1026	3307	35	1023	3297	33	1036	3341
Mathematics and Statistics Total			184	4531	16844	171	4227	15623	176	4353	15935	174	4422	15923	190	4114	14940

	Mathematics and Statistics Departmental Data, 2016-17 through 2020-21									
	Credit Hours by Major									
	2016-17		2017-18		2018-19		2019-20		2020-21	
	Enrolled	SCH	Enrolled	SCH	Enrolled	SCH	Enrolled	SCH	Enrolled	SCH
ESSL										
1. Math and Stat majors	2	6			1	3	1	3		
2. Non majors	26	78			56	168	30	90	57	171
ESSL Subtotal	28	84			57	171	31	93	57	171
MATH										
1. Math majors	164	568	147	516	176	587	208	655	211	711
2. Other Math and Stat	33	108	39	132	37	103	21	63	24	75
3. Non majors	3256	12720	2999	11628	3028	11680	3139	11815	2786	10642
MATH Subtotal	3453	13396	3185	12276	3241	12370	3368	12533	3021	11428
STAT										
1. Statistics majors	17	52	34	102	42	126	23	69	12	36
2. Other Math and Stat	16	48	17	52	14	43	23	69	26	80
3. Non-majors	1017	3264	991	3193	970	3138	977	3159	998	3225
STAT Subtotal	1050	3364	1042	3347	1026	3307	1023	3297	1036	3341
Mathematics and Statistics Totals										
1. Math and Stat majors	232	782	237	802	270	862	276	859	273	902
2. Non-majors	4299	16062	3990	14821	4054	14986	4146	15064	3841	14038
Grand Total	4531	16844	4227	15623	4324	15848	4422	15923	4114	14940

Mathematics and Statistics Departmental Data, 2016-17 through 2020-21

Credit Hours by Faculty Type

	2016-17				2017-18				2018-19				2019-20				2020-21			
	CCH cnt	SCH	SCH %	Head cnt %	CCH	SCH	SCH	Head cnt %	CCH	SCH	SCH %	Head cnt	CCH	SCH	SCH %	Head cnt	CCH	SCH	SCH	Head cnt %
ESSL																				
T/TT	3	84	100%	0					6	171	100%	0	3	93	100%	0	6	171	100%	0
ESSL Subtotal	3	84		0					6	171		0	3	93		0	6	171		0
MATH																				
T/TT	253	5040	38%	11	235	4575	37%	10	217	4218	34%	10	212	4095	33%	9	241	4190	37%	11
FT NonTT	189	5621	42%	6	227	6600	54%	9	229	6731	54%	9	267	7846	63%	11	297	6506	57%	12
PT	97	2735	20%	9	41	1101	9%	6	52	1421	11%	5	16	592	5%	2	24	732	6%	3
MATH Subtotal	539	13396		26	503	12276		25	498	12370		24	495	12533		22	562	11428		26
STAT																				
T/TT	36	963	29%	1	50	1382	41%	2	62	1455	44%	3	61	1552	47%	3	55	1686	50%	2
FT NonTT	60	1903	57%	3	47	1656	49%	2	51	1621	49%	2	46	1517	46%	1	46	1382	41%	1
PT	12	498	15%	2	9	309	9%	2	6	231	7%	1	6	228	7%	1	6	273	8%	1
STAT Subtotal	108	3364		6	106	3347		6	119	3307		6	113	3297		5	107	3341		4
Department Totals																				
T/TT	292	6087	36%	12	285	5957	38%	12	285	5844	37%	13	276	5740	36%	12	302	6047	40%	13
FT NonTT	249	7524	45%	9	274	8256	53%	11	280	8352	53%	11	313	9363	59%	12	343	7888	53%	13
PT	109	3233	19%	10	50	1410	9%	7	58	1652	10%	5	22	820	5%	2	30	1005	7%	3
Grand Total	650	16844		31	609	15623		30	623	15848		29	611	15923		26	675	14940		29

Faculty headcount notes: T/TT and FT NonTT are counted once, in the primary subject in which they teach. When there are credit hours shown for a subject but the faculty headcount is 0, that means all faculty teaching in that subject also teach other subject(s) and have been recorded under the other subject.

Part-time faculty are counted once in each subject in which they teach, but are only counted once in the department total.

Mathematics and Statistics Departmental Data, 2016-17 through 2020-21

Ratio of full-time equivalent students (FTES) to full-time equivalent faculty (FTEF)

	2016-17			2017-18			2018-19			2019-20			2020-21		
	FTES	FTEF	FTES:FTEF	FTES	FTEF	FTES:FTEF	FTES	FTEF	FTES:FTEF	FTES	FTEF	FTES:FTEF	FTES	FTEF	FTES:FTEF
ESSL	2.8	0.1	22.4				5.7	0.3	22.8	3.1	0.1	24.8	5.7	0.3	22.8
MATH	446.5	22.5	19.9	409.2	21.0	19.5	412.3	20.8	19.9	417.8	20.6	20.3	380.9	23.4	16.3
STAT	112.1	4.5	24.9	111.6	4.4	25.3	110.2	5.0	22.2	109.9	4.7	23.3	111.4	4.5	25.0
Department Total	561.5	27.1	20.7	520.8	25.4	20.5	528.3	26.0	20.4	530.8	25.5	20.8	498.0	28.1	17.7

FTES- full-time equivalent student, equal to total student credit hours divided by 30 (the academic year full-time load for students) FTEF- full-time equivalent faculty, equal to total course credit hours divided by 24 (the academic year full-time load for faculty)

Mathematics and Statistics Departmental Data, 2016-17 through 2020-21

Essential Learning Courses

Subject	Course	Cr Hrs	2016-17			2017-18			2018-19			2019-20			2020-21		
			Sect	Enrolled	SCH	Sect	Enrolled	SCH	Sect	Enrolled	SCH	Sect	Enrolled	SCH	Sect	Enrolled	SCH
ESSL																	
290	Milestone	3										1	31	93	2	57	171
ESSL Subtotal												1	31	93	2	57	171
MATH																	
110	College Mathematics-GTMA1	3	14	394	1182	12	413	1239	12	419	1257	13	454	1362	27	559	1677
113	College Algebra-GTMA1	4	42	1429	5716	33	1158	4632	34	1207	4828	36	1238	4952	43	1062	4248
119	Precalculus Mathematics-GTMA1	5	12	311	1555	13	297	1485	12	267	1335	11	268	1340	11	251	1255
151	Calculus I-GT-MA1	5	7	191	955	7	192	960	7	180	900	7	175	875	8	176	880
205	Elements of Math II-GTMA1	3	3	49	147	3	63	189	3	68	204	3	57	171	3	50	150

MATH Subtotal			78	2374	9555	68	2123	8505	68	2141	8524	70	2192	8700	92	2098	8210
Mathematics and Statistics Total			78	2374	9555	68	2123	8505	68	2141	8524	71	2223	8793	94	2155	8381

Mathematics and Statistics Departmental Data, 2016-17 through 2020-21 Faculty List				
Last name	**First Name**	**Category**	**Title (In Banner)**	
Berrizbeitia	Ana	T/TT	Assistant Professor of Math	
Bonan-Hamada	Catherine	T/TT	Professor of Math	
Bonan-Hamada	Edward	T/TT	Assoc Prof of Math	
Driskell	Lisa	T/TT	Assoc Professor of Math	
Friedman	Theresa	T/TT	Professor of Math	
Gustafson	Philip	T/TT	Professor of Mathematics	
King	James	T/TT	Asst Professor of Statistics	
Miles	Eric	T/TT	Asst Professor of Mathematics	
Ott	Richard	T/TT	Associate Prof of Statistics	
Packard	Erik	T/TT	Associate Professor of Math	
Reitenbach	Markus	T/TT	Assoc Professor of Math	
Schultz Ela	Daniel	T/TT	Professor of Math	
Wendler	Megan	T/TT	Asst Professor of Math	
Barnard	Andrea	FT NonTT	Instructor of Math	
Farrell	Cathleen	FT NonTT	Instructor of Mathematics	
Fischer	Marc	FT NonTT	Instructor of Math	
Hillman	Heath	FT NonTT	Instructor of Math	

McFarland	Max	FT NonTT	Instructor of Mathematics	
Mitchell	Holly	FT NonTT	Instructor of Math	
Ortiz	Marcos	FT NonTT	Instructor of Math	
Ryan	Molly	FT NonTT	Instructor of Math	
Seligson	Leo	FT NonTT	Instructor of Math	
Snyder	Patrick	FT NonTT	Instructor of Math	
Stephens	Andrew	FT NonTT	Instructor of Math	
Ward	Wayn	FT NonTT	Instructor of Math	
Wendler	Enzo	FT NonTT	Instructor of Math	
Bollinger	Jesse	PT	Lecturer of Mathematics	
Graus	Timothy	PT	Lecturer of Math	
Hale	Steven	PT	Lecturer of Math	

Only includes faculty who are listed as primary instructor of record for a course taught in summer 2019, fall 2019 or spring 2020. Faculty who were on sabbatical or on leave for the entire year may therefore be omitted, even if they were still on the payroll.
In some cases (such as clinical instructors or teachers of applied music lessons) an instructor might not be the primary instructor for any course and might therefore be omitted from this list. Typically, this would only apply to part-time faculty.

Department of Mathematics and Statistics

Departmental Expenditures

FY15 - FY21

Mathematics and Statistics Departmental Data							
Annual Expenditures							
Acct	Account Title	FY15	FY16	FY17	FY18	FY19	FY20	FY21
5006	STATE CLASSIFIED REG FT WAGES	30,118.09	32,516.82	33,266.88	32,948.79	32,012.28	34,743.80	33,578.90
5086	STATE CLASSIFIED OVERTIME WAGES			0.00	25.73			
5106	STATE CLASSIFIED SHIFT DIFF					1.80		9.60
5116	STATE CLASSIFIED ANNUAL LEAVE	3,047.53	2,366.73	866.69	2,126.87	2,862.03	1,619.80	3,594.50
5126	STATE CLASSIFIED SICK LEAVE	551.14	783.37	533.35	600.34	1,704.83	1,783.60	1,838.20
5127	SPS COMPESATORY TIME PAID					39.75		218.40
5146	STATE CLASSIFIED MEDICARE	483.10	513.26	498.76	513.64	526.69	547.90	562.39
5166	STATE CLASSIFIED PERA	3,381.72	3,491.28	3,491.28	3,595.42	3,690.43	3,929.79	4,126.09
5168	STATE CLASSIFIED PERA AED	1,332.72	1,513.50	1,651.08	1,771.17	1,816.16	1,889.42	1,888.76
5169	STATE CLASSIFIED PERA SAED	1,249.44	1,461.90	1,633.86	1,771.17	1,816.16	1,889.42	1,888.76
5206	STATE CLASSIFIED DENTAL INS	311.04	311.04	311.04	311.04	324.00	334.91	322.30
5216	STATE CLASSIFIED HEALTH INS	5,209.20	5,587.40	5,587.44	6,006.72	6,578.25	7,177.31	7,589.08
5226	STATE CLASSIFIED LIFE INS	84.00	105.60	105.60	107.76	112.25	91.92	92.21
5236	STATE CLASSIFIED DISABILITY	74.16	65.88	65.88	67.80	54.89	57.16	57.28
5255	FACULTY REGULAR FT WAGES				849,064.81	928,654.60	835,962.84	939,486.23
5256	ADMIN REGULAR FT WAGES	862,010.92	867,891.49	896,963.08				
5258	DEPT HEAD STIPENDS				5,715.65	5,713.18	6,193.00	6,298.42
5285	FACULTY TEMP FT WAGES				444,783.41	457,720.90	494,738.86	561,580.73
5286	ADMIN TEMP FT WAGES	303,717.16	312,998.72	408,837.77	859.95			
5295	FACULTY TEMP PT WAGES				16,200.00	55,123.20	9,750.00	14,999.93
5296	ADMIN TEMP PT WAGES	66,776.13	61,423.11	100,675.33				
5366	FACULTY OVERLOAD	42,900.00	33,350.00	36,529.34	42,950.01	28,950.05	28,209.99	36,049.93
5386	FACULTY/ADMIN ANNUAL LEAVE		652.51	21,974.35	6,701.83			
5416	FACULTY/ADMIN DCPP - TIAA	79,794.40	81,247.92	83,001.31	67,769.35	89,752.86	122,154.78	136,933.66
5426	FACULTY/ADMIN DCPP - FIDELITY	15,711.66	16,211.66	17,109.93	28,531.54	16,329.89	0.00	
5436	FACULTY/ADMIN DCPP - VALIC	8,111.64	8,427.40	13,383.69	14,040.24	7,750.46	0.00	
5446	FACULTY/ADMIN MEDICARE	17,258.95	17,180.51	19,849.23	18,678.39	18,554.97	18,858.34	21,365.10

5466	FACULTY/ADMIN PERA	25,690.48	25,164.43	37,815.30	31,442.16	29,042.23	26,729.33	29,932.83
5468	FACULTY/ADMIN PERA AED	10,157.16	10,960.38	17,921.89	15,488.82	14,294.32	12,850.62	13,700.56
5469	FACULTY/ADMIN PERA SAED	9,532.65	10,601.31	17,745.21	15,488.82	14,294.32	12,850.62	13,700.56
5506	FACULTY/ADMIN DENTAL INSURANCE	9,876.97	11,054.48	11,173.58	10,644.96	9,725.76	9,989.36	10,899.76
5516	FACULTY/ADMIN HEALTH INSURANCE	171,599.47	186,033.84	202,929.01	205,397.84	189,742.22	205,828.75	214,923.46
5526	FACULTY/ADMIN LIFE INSURANCE	3,714.88	3,744.64	4,019.19	3,917.40	3,606.33	4,013.10	4,524.91
5536	FACULTY/ADMIN DISABILITY	2,502.62	2,519.64	2,383.17	2,155.56	1,985.97	2,159.01	2,308.42
5606	FEDERAL WORK STUDY MATCH	535.50		402.13				
5706	STUDENT ASSISTANTS	2,282.51	3,333.33	4,233.33	6,253.44	3,800.62	2,545.10	327.32
5816	STUDENT MEDICARE CONTRIBUTION	1.25				14.50		
6100	PROFESSIONAL FEES EXTERNAL		524.40			4,115.00	30.00	
6150	EMPLOYEE TRAVEL - IN STATE	2,478.25	466.49	1,520.64	2,883.01	3,210.38	773.73	2,044.00
6160	EMPLOYEE TRAVEL - OUT OF STATE	390.46	2,865.50	734.20	2,185.77	1,993.66	3,659.35	
6170	EMPLOYEE TRAVEL - INTERNATIONAL					1,300.00		
6196	SOFTWARE MAINTENANCE CONTRACTS					1,785.00		
6201	SUPPLIES	5,037.97	3,641.93	5,482.52	7,202.00	3,771.47	4,449.77	3,212.46
6203	SUPPLIES - COURSE FEE FUNDED		1,549.70	750.00				
6211	SOFTWARE	48.84						
6310	SUBSCRIPTIONS & BOOKS		140.35		108.20	103.78		241.30
6350	PERSONNEL RECRUITING - IN STATE						264.00	
6360	PERSONNEL RECRUITING - OUT OF STATE	670.97	125.65	545.61	2,154.81		2,380.13	
6401	TELEPHONE CALLS	20.88	18.46	17.57	45.11	14.80	12.62	6.85
6410	TELEPHONE EQUIPMENT	9,174.00	10,098.00	9,306.00	8,514.00	8,712.00	8,712.00	
6430	POSTAGE	26.07	81.62	8.63	13.71	1.91	2.63	14.34
6480	ADVERTISING			240.00			565.00	
6760	RENT/LEASE EQUIPMENT	3,470.44	3,519.90	6,514.95	7,192.11	595.28		
6761	RENT/LEASE EQUIPMENT - COPIER					7,197.65	6,380.81	3,578.37
6830	OFFICIAL FUNCTIONS STUDENT RELATED			217.30		0.00	804.52	118.22
6840	OFFICIAL FUNCTION MEETINGS SEMINARS	312.62		234.00		0.00	440.58	87.00
6850	OFFICIAL FUNCTIONS	228.52	209.93	477.20	349.90	489.29	390.80	82.75
6851	OFFICIAL FUNCTIONS TRAINING RELATED						103.98	

6890	CLUB ALLOCATION				1,250.00	500.00		
6990	PROCURMENT CARD				61.54	-61.54		
7150	PROFESSIONAL DEVELOPMENT		1,230.00			465.00		
8100	EQUIPMENT NON-CAPITAL				2,199.00	51,571.76		
8101	COMPUTER EQUIPMENT NON-CAPITAL	1,609.26	1,167.00		399.00	815.00	1,568.00	
8201	BOOKS, PRINT			90.43				
Total	Expenditure Total	1,701,484.77	1,727,151.08	1,971,097.75	1,870,488.79	2,013,215.58	1,877,436.65	2,080,895.58

APPENDIX C
Curriculum Vitas

Andrea Barnard

Instructor of Mathematics

Colorado Mesa University

Education:

- MEd, Curriculum and Instruction with an emphasis in Mathematics,
  University of Texas at Arlington, 2011
- BS, Secondary Education in Mathematics and Physics, Brigham Young
  University-Idaho, 2009
- AS, General Education, Brigham Young University-Idaho, 2005
- 6-12 Teaching Certificate, Colorado
- Department of Education, 2009-2013 Idaho Educational Technology Certificate, State of
  Idaho

Teaching 2003-Present:

Courses Taught

- MATH 105, Elements of Mathematics I (both online and in person)
- MATH 110, College Math (both online and in person)
- MATH 113, College Algebra
- MATH 205, Elements of Mathematics II (both online and in person)
- MATH 301, Mathematics for Elementary Teachers (both online and in person)
- EDUC 480C, Methods for Teaching Secondary Mathematics
- EDUC 580C, Secondary Methods for Mathematics Teaching

Evidence of Continuous Improvement

- Welcome Back and Faculty Development, Fall 2021
- "Social" Distance Education Webinar Series, Summer and Fall 2020
- Lumen OHM Platform Training, August 2020
- Dr. John Nicoletti's Workshop on Campus Safety and Threat Assessment October 15,
  2019
- CMU's Meeting with Dr. Donna Beegle on Breaking Barriers for Students in/from
  Poverty on January 12, 2017
- CMU's 2-Part Ala Carte Professional Development Program on Friday August 18, 2017
- CMU's Course Meeting "Critical Thinking Unmasked: How to Infuse it into a Discipline
- Based" presented by Dr. Linda Nilson, Clemson University on Friday, August 19, 2016

- CMU's Safe Zone Training on April 18, 2016 at 3:30pm
- Parallel sessions at the Mathematical Association of America Conference hosted by CMU on April 8-9, 2016 Innovative Educators' Webinar "Designing Effective Rubrics" sponsored by Assessment on April 8, 2016
- CSMS Department's Degree Works Training on March 24, 2016
- CMU's Distance Education Training "The Gift of Gab" on March 24, 2016
- CMU's Classroom Management Training Sessions for Faculty on January 15, 2016
- CMU's Meeting with Dr. Jeff Rosen, HLC Vice President for Accreditation
- Relations, regarding changes to theaccreditation process on January 14, 2015
- CMU Distance Education's Webinar "50 Shades of Grades - Gradebook Help" on December 1, 2015
- Online seminar presented by CMU's Distance Education, the Library, and Magna on Copyright Laws on March 5, 2015
- Attended all three sessions (Campus Safety, Suicide Prevention Efforts, Sexual Assault Harassment Prevention) ofCMU's Campus In-service Training on March 3, 2015
- CMU's faculty colloquium with Dr. Jennifer Daniels presenting on an investigation into STEM Education and Experiential Learning on February 18, 2015
- CMU's FERPA Training Sessions for Faculty on February 4, 2015
- CMU's Program Assessment and Reporting Meeting with Dr. Gloria Rogers on January 14, 2015
- CMU Distance Education's "What Makes a Successful Online Course?" with David A.T. Hall (Instructional Designer Candidate) on Friday, August 29, 2014
- CMU's Spring Teacher 2 Teacher Program "What Works for Me" on April 1, 2014
- Dr. John Nicoletti's Workshop on Campus Safety Education and Awareness, February 12, 2014
- Dr. Terrel Rhodes's Workshop on Rubrics and ePortfolios January 16 and 17, 2014
- Mesa Valley County School District 51's Workshop on Teaching those who speak English as a Second Language June 4 and 5, 2013

Scholarship and Creative Work, 2003-Present:

Scholarship Related to Discipline

Conference Presentation:

"Using System Dynamics Modeling to Determine How Coal-Burning Power Plants Would Affect the Flow of the Powder River," PosterPresentation at the Department of Energy Intern Poster Seminar, Idaho National Lab, Idaho Falls, ID (2009).

Other

Unpublished Papers:

"The Effects of Participating in Integrated Mathematics Curricula on Students' Mathematics and Reading Abilities," UnpublishedCapstone Research Project and Paper, University of Texas at Arlington (2011).

"Factors Contributing to American Students' Lower Math Scores Relative to Asian Countries," Unpublished Undergraduate Research Paper and Presentation, Brigham Young University-Idaho (2005).

Service 2003-Present:

<u>Department</u>

- Regularly teach overloads to cover essential learning classes
- Attend department meetings as teaching schedule permits
- Taught a special section of Math 113 in the Fall of 2017 for students needing extra support
- Compiled GT Pathways Documentation for the Math 205 Course for reapproval in the Spring of 2017
- Participated in the department's ACCUPLACER Diagnostic Pre-Test to collect data on student placement
- Served on several Math 110 Book Selection Committee
- Served on the Math 110 Recreation Team beginning in Fall 2019 to present

Advising 2003-Present:

<u>University level</u>

- Help advise the large load of elementary education majors with mathematics emphases
- Informally advise students on courses to take and other academic decisions
- Numerous letters of recommendation especially for the elementary education students applying to the program

Honors and Awards 2003-Present:

<u>National</u>

- Educational Testing Service Recognition of Excellence Award for The Praxis Series Mathematics: Content Knowledge Exam 2007

<u>Local</u>

- Mesa County Retired School Employees Association 2011 Scholarship
- Academic Distinction of Magna Cum Laud at Brigham Young University-Idaho 2009 Brigham Young University-Idaho
- President's Academic Awards Rexburg, ID 2004-

2009 Brigham Young University-Idaho University
Academic Scholarship 2004-2009

Professional Experience:

- Presented a professional development workshop for the Rifle Re-2 School District's secondary education teachers on August 6 - 7, 2015

- Department of Energy Pre-Service Teacher Intern at Idaho National Laboratory 2009

Ana Berrizbeitia

1100 North Avenue, Grand Junction, CO 81501

(970)248-1563

aberrizbeitia@coloradomesa.edu

CURRICULUM VITAE

EDUCATION

- **Ph.D. Mathematics,** University of Iowa, Iowa City, IA - August 2018 *Thesis:* "Invariant Rings of Taft Algebras Acting on Path Algebras" *Thesis Advisor:* Ryan Kinser
Course Work GPA: 4.04/4.00

- **Graduate Certificate in College Teaching,** University of Iowa, Iowa City, IA - May 2018

- **MSRI Graduate Student Summer School**, July 11, 2016 - July 22, 2016 *Topic:* An Introduction to Character Theory and the McKay Conjecture

- **M.A. Mathematics,** University of Texas at Austin, Austin, TX - December 2012
Course Work GPA: 3.66/4.00

- **M.A. Minor in Education,** University of Texas at Austin, Austin, TX December 2012

- **BS, Mathematics with Honors**, The University of Texas at Austin, Austin, TX - May 2009
Mathematics GPA: 3.94/4.00, *General GPA:* 3.73/4.00
Undergraduate Honors Thesis Advisor: Dr. Geir Helleloid

AWARDS AND FELLOWSHIPS

- **Project NExT Fellow** 2019, Silver Dot

About the fellowship: Project NExT is a professional development program for new mathematics faculty, which provides its selected fellows with networking opportunities, teaching workshops, mentors, and the opportunity to organize talks at two of the largest mathematics conferences in America.

- **The University of Iowa's Outstanding Teaching Assistant Award**, 2016-2017

About the award: The Outstanding TA Award is a prestigious honor, which is granted once a year to the top 1% of all teaching assistants at the university.

- **Post-Comprehensive Research Fellowship**, University of Iowa, Fall 2017 *About the award:* Competitive award granted to excelling graduate students to focus on research without teaching duties for one semester.

- **Sloan Mini Grant**, University of Iowa, Summer 2017

- **NSF Research Assistantship**, University of Iowa, Spring 2017

About the award: Research assistantship from Professor Bleher's personal NSF grant to support one student for one semester without teaching duties.

- **GAANN Fellowship**, University of Iowa, Fall 2013 - Spring 2015 *About the award:* Competitive award granted to promising incoming graduate students providing support without teaching duties during the first two years.

- **VIGRE Fellowship**, University of Wisconsin at Madison, 2009

About the award: Competitive award granted to promising incoming graduate students providing support without teaching duties for one semester.

- **American Physical Society (APS) Minority Scholarship**, 2006

About the award: Undergraduate scholarship for minorities pursuing physics degrees.

- **Marcel and Conrad Schlumberger Scholarship**, 2005-2009 *About the award:* Undergraduate scholarship

TEACHING

Assistant Professor of Mathematics, Colorado Mesa University, 2018 - present

- Introduction to Advanced Mathematics: Fall 2021
- College Algebra Online: Spring 2021 (3.62/5.00), Fall 2021
- Topology: Spring 2021 (4.42/5.00)
- Number Theory: Fall 2020 (4.45/5.00)
- Discrete Structures I: Fall 2020 (3.54/5.00)
- Geometries: Spring 2020 (4.83/5.00)
- Calculus II: Spring 2020 (4.42/5.00)
- Precalculus: Spring 2020 (3.93/5.00), Fall 2019 (4.25/5.00), Spring 2019 (4.33/5.00), Fall 2018 (3.96/5.00)
- College Mathematics: Fall 2019 (4.54/5.00), Spring 2019 (4.25/5.00), Spring 2019 (3.85/5.00) Fall 2018 (4.11/4.00)
- Calculus I: Fall 2020 (4.05/5.00), Summer 2020, Fall 2019 (4.35/5.00), Fall 2018 (4.75/5.00)

- **Teaching Assistant**, University of Iowa, August 2015 - May 2018 Iowa City, IA

  Duties included: creating weekly worksheets, leading recitation sections, assigning homework, grading exams and quizzes, holding reviews, and holding office hours.

  - Abstract Algebra: Fall 2016 (5.81/6.00)
  - Geometry: Fall 2016 (5.53/6.00)
  - Calculus I for Business: Spring 2016 (5.50/6.00)
  - Calculus I: Fall 2015 (5.43/6.00)

- **Research Mentor**, Camp Euclid, 2013-2015

  Duties included: Mentoring advanced high school students in mathematical research.

- **Teaching Assistant**, University of Texas at Austin August 2011 - December 2012

Austin, TX
Duties included: creating weekly worksheets, leading recitation sections, assigning homework, grading exams and quizzes, holding reviews, and holding office hours.

- Calculus I: Fall 2012 (4.8/5.0)
- Calculus II: Spring 2012 (4.3/5.0)
- Abstract Algebra I: Fall 2011 (n/a - TA Grader)

- **Graduate Student Assistant for MSRI-UP**, June 2012 - July 2012 Berkeley, CA
  Research Director: Professor Matthias Beck

  - Supervised and guided the research of two undergraduate groups in combinatorics and number theory projects
  - One of the projects led to the work in my second publication in 2015.

- **Teaching Assistant**, University of Wisconsin, August 2009 - December 2009 Madison, WI
  Duties included: creating weekly worksheets, leading recitation sections, assigning homework, grading exams and quizzes, and holding office hours.

  - Calculus I, August 2009 - December 2009
    Received a 4.67/5.00 score on TA evaluations

- **Professional Tutoring**
  Austin, TX, Iowa City, IA, and Online

  - WyzAnt Inc., September 2010 - present

    * Tutored over 1300 hours for WyzAnt Inc.
    * Earned a five-star rating from nearly 500 reviewers
    * Received a national distinction from WyzAnt for excellence
    * Experienced teaching all levels of undergraduate math, and first year graduate math
  - Cram Crew Inc., January 2010 - August 2010
  - Austin Tutors, August 2010 - December 2012 – Private independent tutoring

    * Estimated 5000 hours

- **University Tutoring**, University, 2005-present Austin, TX, Iowa City, IA, and Online

  - University of Iowa Math Lab
  - University of Iowa Tutors
  - University of Texas Learning Center
  - University of Texas Emerging Scholars Student Assistant
  - University of Texas Residential Hall Program

RESEARCH INTERESTS

- Hopf Algebras

  - Actions of Hopf Algebras on Path Algebras

- – Quantum Groups
- Invariant Theory
- Combinatorics

PUBLICATIONS

- Parking Functions, Shi Arrangements, and Mixed Graphs (with M. Beck, M. Dairyko, C. Rodriguez, A. Ruiz and S. Veeneman) American Mathematical Monthly 122 (2015), 660-673.
- The p-adic Valuation of Stirling Numbers (with L. Medina, A. Moll, V. Moll and L. Noble)
  Journal for Algebra and Number Theory Academia 1, 2010, 1-30.

SERVICE

- Rocky Mountain Sectional Meeting Social Session Organizer, April 2021
- Math Club Faculty Advisor, Fall 2019 - present
- Mathematics Department Assessment Committee Representative, Fall 2019 present
- GirlsDoMath Summer Enrichment Camp - Session Leader (Summer 2019)
- Math Extravaganza - Game Session Organizer (Spring 2019)
- Math Program Working Group - Participant (Fall 2018 - present)
- Chair of Graduate Student Invariant Theory Seminar Organizing Committee (2017 - 2018)
- Math department representative for the Campaign to Organize Graduate Students Union (2015-2017)
- Primary organizer of Sonia Kovalevsky Day Outreach (2017)
- Mathematics Graduate Board Heartland Intercollegiate Liaison (2016-2017)
- Member of Sonia Kovalevsky Day Organizing Committee (2016)
- Member of Lucas Elementary Day Organizing Committee (2016)

TALKS AND CONFERENCES

- (Invited Speaker) "Invariants of Hopf Algebras on Path Algebras of Quivers," AMS Special Session on Quivers, Tensors and Their Applications, May 2021

- (Invited Speaker) "Invariants of Hopf Algebras on Path Algebras of Quivers," Spring Eastern Sectional Meeting, March 2021

- (Invited Speaker) "Invariants of Hopf Algebras on Path Algebras of Quivers," American Mathematical Society Joint Math Meetings, Zoom Conference, January 2021

- (Fellow) Project NExT at JMM, Denver, CO, July 2019 - August 2020

  - Minicourse attended: Mastery Based Grading

  - Minicourse attended: Visual Complex Analysis- GeoGebra Tools and Mapping Diagrams

- (Invited Speaker) Metropolitan State University, "Parking Functions, Shi Arrangements and Mixed Graphs," November 2019

- (Fellow) Project NExT at MathFest, Cincinnati, OH, July 2019

- (Invited Speaker) 7th Annual Midwest Women in Mathematics Symposium, University of Iowa, "Invariants of Hopf actions on path algebras of quivers," April 2019

- (Regular Speaker) University of Iowa, August 2013 - May 2018

  - Algebra Seminar

  - Invariant Theory Seminar

  - Derived and Cluster Categories Seminar

  - Topology Seminar

  - Topology Reading Seminar

- (Poster) "Invariant rings of Taft algebras acting on path algebras," Algebra Extravaganza Conference, Temple University, July 2017

- (Invited speaker) "Parking Functions, Shi Arrangements and Mixed Graphs," Heartland Partnership, Grinnell College, May 2017

- (Invited speaker) "Parking Functions, Shi Arrangements and Mixed Graphs," at Heartland Partnership, St. Ambrose College, April 2017

- (Participant) Geometric Methods in Representation Theory, Columbia, MO, November 2016

- (Participant) Field of Dreams Conference, Math Alliance Organization, St. Louis, MO, November 2016

- (Participant) 3rd Annual Midwest Women In Mathematics Symposium, Chicago, IL, March 2015

- (Invited speaker) "Parking Functions, Shi Arrangements and Mixed Graphs,"

- (Participant) Texas Geometry and Topology Conference, UT Austin, November 2014

- (Speaker) "Parking Functions, Shi Arrangements and Mixed Graphs," USTARS Conference, UC Berkeley, April 2014

- (Speaker) "p-Adic Valuations of Stirling Numbers of the Second Kind," American Mathematical Society Joint Math Meetings, Washington DC, January 2009

- (Poster) "p-Adic Valuations of Stirling Numbers of the Second Kind," SAGNAS Conference, Salt Lake City, UT, 2008

ADVISING

- Undergraduate Student Advisees

  - John Brummett (2021 - Present)

  - Logan Freerksen-Winter (2021 - Present)

  - Anne Sponheim (2020 - Present)

  - Gregg Castanuela (2020 - 2021)

  - Anita M. Davila (2019 - Present)

  - Matthew R. Montoni-Tiller (2019 - Present)

  - David Vandenakker (2019 - 2020)

LANGUAGES

- English (Fluent)

- Spanish (Fluent)

- French (Advanced)

EMPLOYMENT STATUS

US Citizen

Catherine Bonan-Hamada

Colorado Mesa University, 1100 North Avenue, Grand Junction, Colorado, 81501

970-248-1838 – cbonan@coloradomesa.edu

Education

o **University of Colorado**		**Boulder, Colorado**
PhD in Mathematics		*1994*
o **Colorado State University**		**Fort Collins, Colorado**
(BS in Applied Mathematics) MS in Mathematics		*(1986) 1988*

Professional Experience

Academic Positions. . . . .

o **Colorado Mesa University (formerly Mesa State College)**		**Grand Junction, CO**
Professor 2006-present; Associate Prof 2000-2006; Assistant Prof 1996-2000		*1996–present*
o **Western Oregon State College**		**Monmouth, Oregon**
Assistant Professor of Mathematics		*1994–1996*

Sabbaticals. . . . .

o **Colorado Mesa University**		**Grand Junction, CO**
Analytic theory of continued fractions and digital signal processing		*fall 2013*
o **Colorado Mesa University**		**Grand Junction, CO**
Continued Fraction Handbook Project		*fall 2003*

Courses Taught at Colorado Mesa University. . . . .

o Real Analysis I, Abstract Algebra I&II, Senior Seminar I&II, Complex Variables, Knot Theory, History of Math, Linear Algebra I&II, Advanced Calculus, Introduction to Advanced Mathematics, Calculus Skills and Pedagogy (grad class for educators), Calculus I&II, Precalculus, Honors Math, Trigonometry, College Algebra, College Mathematics, Mathematical Investigations

Teaching Awards. . . . .

o **Outstanding Educator Award**		**Grand Junction, CO**
From the Grand Junction Chamber of Commerce		*2002 and 2005*
o **Outstanding Teacher Award**		**Grand Junction, CO**
From the Associated Student Government, Mesa State College (now CMU)		*2004*
o **Burton W. Jones Graduate Teaching Excellence Award**		**Boulder, Colorado**
From Department of Mathematics, University of Colorado Boulder		*1992*

Professional Development

o Introduction to Open Educational Resources by Dustin Fife from the State of Colorado OER Council, October 2020

o Summer Webinar Series: (Social) Distance Education by Distance Education Team, CMU, twice a week June 2-July 23, 2020

o MS Teams and Voicethread Training by Distance Education Team, CMU, June 29, 2020

o Visual Complex Analysis with Geogebra Minicourse by Martin Flashman, Denver JMM, January 2020

o D2L Training by Distance Education, CMU, January 20, 2020

o T2T G.I.F.T. Presentations October 23, 2019

o College Algebra Communities of Practice, Dept of Math/Stat, September 20, October 18, November 15, 2019

o Introduction to Desmos by Heath Hillman, First Friday Faculty Development for Dept. of Math and Stat, Oct. 4, 2019

o Tactile Activities in Class by Dr. Lisa Driskell, First Friday Faculty Development for Dept. of Math and Stat, Sept. 6, 2019

o What's New with D2L, CMU Distance Learning Team, August 14, 2019

o Boundaries and Behaviors by John Marshall, VP for Student Services, CMU Professional Development, Aug. 14, 2019

o Invisible Disabilities by Sam Dieguez, CMU Educational Access Services, and Liz Prickett, CMU Distance Education, CMU Professional Development, August 14, 2019

o Campus Safety by GJPD Chief Stonemaker and John Marshall, VP for Student Services, March 1, 2019

o Suicide Prevention by Anna Mueller, February 15, 2019

o CRM Advise Training I and II, by Jeremy Brown, CMU Information Technology, January 1421, 2019

o Math Circle Minicourse by Jane Long, Baltimore JMM, January 2019

o Innovative Leadership Workshop by Elizabeth Long Lingo, CMU, January 2018

o Grant Proposal Writing Workshop, CMU Office of Sponsored Programs, January 9-11, 2018

o Inclusiveness (Workshop C), CMU Faculty Professional Development Workshop, August 17, 2018

o Advising (Workshop B), CMU Faculty Professional Development Workshop, August 17, 2018

o Title IX and Sexual Harassment, CMU Professional Development, April 17, 2018

o Safety Training by Dr. John Nicoletti, April 12, 2018

o Inclusion and Supportive Culture by Dr. Nita Mosby Tyler, April 16, 2018

o Academic Research Dollars: Supporting the Teacher–Scholar Model, CMU, August 2017

o Movement and Learning, Faculty Colloquium, September, 2017

- Advance WebAssign and Integration with D2L, August 2017

- Academic Research Dollars: Supporting the Teacher Scholar Model, August 18, 2017

- Developing your Leadership Groove, Faculty Prof Dev Workshop, August 18, 2017

- D2L Training by Xin Wang and Jessica Evans, CMU, August 31, 2016

- DegreeWorks Training, CMU, March 24, 2016

- Dealing with Volatile Students by Bob Lang, Pua Utu, Dana VandeBurgt, and Steve Werman, Faculty Professional Development Workshop, CMU, January 15, 2016

- ***Similar level of professional development activity prior to 2016***

Supervision of Student Research

- Mentor for mathematics student who studied regular continued fractions and the approximation of irrational numbers for her senior research project. The student will present at the 2021 CMU Student Showcase. (2020-2021)

- Mentor for mathematics education student who studied incorporating movement into mathematics instruction for her senior research project. The student presented at the 2020 CMU Student Showcase. (2019-2020)

- Mentor for mathematics student who studied convergence regions for continued fractions for her senior research project. The student presented at the 2015 CMU Student Showcase and at a Mathematics Colloquium. (2014-2015)

- Course instructor for Senior Seminar I (49 students total) and Senior Seminar II (43 students total). This course sequence is an introduction to conducting mathematics research. Each student completed an in-depth research project under the supervision of the course instructor and a faculty mentor. (2009-spring 2016, fall 2017-spring 2019)

- Mentor for mathematics student who studied numerical computation of the Schwartz-Christoffel transformation for his senior research project. The student presented at a Mathematics Colloquium. (2007-2008)

- Mentor for mathematics student who studied some of the classical convergence theorems in the analytic theory of continued fractions for his senior research project. The student presented at a Mathematics Colloquium. (2006-2007)

- Mentor for mathematics student who studied applications of complex analysis to fluid flow for his senior research project. The student presented at a Mathematics Colloquium. (2005-2006)

- Mentor for mathematics student who studied the mathematics of the Mandelbrot set for his senior research project. The student presented at a Mathematics Colloquium. (2001-2002)

- Mentor for mathematics student who studied the mathematics of music for his senior research project. The student presented at a Mathematics Colloquium. (2000-2001)

Grant Involvement

- Three MAA Tensor Women and Mathematics Grants $6,000 each used to support GirlsDoMath summer camp at Colorado Mesa University, 2018-2019, 2019-2020 and 2021-2022

- Faculty Professional Development Grants Colorado Mesa University, 2018 and 2019

- Mesa State, Middle School, Math and Science Partnership Content instructor (2008-2010) for federally funded grant through the Colorado Department of Education. The grant goal was to improve the content knowledge of middle school math and science teachers in five high-need school districts in western Colorado.

- MAA "Renewal of College Algebra" Grant $2,000 support for final report, 2008

- MAA's College Algebra Renewal Project $5000 from MAA's NSF grant to investigate the impact of a modeling oriented, application based, college algebra course on student learning and student success, 2005-2007

- Faculty Development Summer Stipend Office of State Colleges Reallocation Funds, 1997, 1998, 1999

- Faculty Professional Development Grant Mesa State College, 1997

Publications

- *Continued fractions associated with Wiener-Levinson filters, frequency analysis, moment theory and polynomials orthogonal on the unit circle* (with W.B. Jones and Olav Njastad), Rocky Mountain Journal of Mathematics, Volume 46, Number 1 (2016) 1-50.

- *Modeling-Oriented College Algebra at Mesa State College* (with Tracii Friedman), in *Partner Discipline Recommendations for Introductory College Mathematics and the Implications for College Algebra,* Mathematical Association of America (2011) 67-73.

- *Zeros of orthogonal Laurent polynomials and solutions of strong Stieltjes moment problems* (with W.B. Jones and Olav Njastad), Journal of Computational and Applied Mathematics, 235 (2010) 895-903.

- *Chapter 5: Moment Theory and Orthogonal Functions,* **Handbook of Continued Fractions for Special Functions**, by Cuyt, Waadeland, Petersen, Verdonk and Jones, Springer, 2008.

- *Steiltjes continued fractions for polygamma functions; speed of convergence* (with W.B. Jones), Journal of Computational and Applied Mathematics, 179 (2005) 47-55.

- *Steiltjes continued fractions and special functions: a survey* (with W.B. Jones), Communications in the Analytic Theory of Continued Fractions (eds. C. Bonan-Hamada and P. Gustafson), Volume XII, (2004) 5-68.

- *Para-Orthogonal Laurent polynomials and the strong Stieltjes moment problem* (with W. B. Jones), Journal of Computational and Applied Mathematics, 105, (1999), 175-185.

- *A class of indeterminate strong Stieltjes moment problems with discrete distributions* (with W.B. Jones, Olav Njastad and W.J. Thron), Orthogonal Functions, Moment Theory and Continued Fractions: Theory and Applications (eds. W.B.Jones and A. Sri Ranga), Marcel Dekker, New York, (1998), 31- 55.

- *Natural solutions of indeterminate strong Stieltjes moment problems derived from PC-fractions* (with W.B. Jones and Olav Njastad), Orthogonal Functions, Moment Theory and Continued Fractions: Theory and Applications (eds. W.B.Jones and A. Sri Ranga), Marcel Dekker, New York, (1998), 15-30.

- *Observations on indeterminate Stieltjes moment problems* (with W.B. Jones and W.J. Thron), Nonlinear Numerical Methods and Rational Approximation II (ed. Annie Cuyt), Kluwer, (1994), 395-408.

o *Discrete distribution functions for log-normal moments* (with W.B. Jones, A. Magnus and W.J. Thron), Continued Fractions and Orthogonal Functions: Theory and Applications (eds. S. Clement Cooper and W.J. Thron), Marcel Dekker, (1993), 1-22.

o *Para-orthogonal Laurent polynomials and associated sequences of rational functions* (with W.B. Jones, A. Magnus and W.J. Thron), Numerical Algorithms vol.3, (1992), 67-74.

o *Para-orthogonal Laurent polynomials* (with W.B.Jones and A. Magnus), Approximation Theory (ed. G. Anastassiou), Marcel Dekker, New York, (1992),125-135.

Contributed and Invited Talks

o *GirlsDoMath in Western Colorado* (with Dr. Tracii Friedman) in the MAA Contributed Session on Inclusive Excellence for the Mathematical Sciences, at the Joint Mathematics Meetings in Denver, Jan. 15-18, 2020

o Invited presentation (with Dr. Tracii Friedman) at the MAA Outreach Pavilion Session on GirlsDoMath Summer Camp for the MAA Tensor Women and Mathematics Grant Program at the Joint Mathematics Meetings in Denver, Jan. 15-18, 2020

o *GirlsDoMath summer camp at Colorado Mesa University* (joint with Dr. Tracii Friedman) in the MAA Contributed Session on Inclusive Excellence–Attracting, Involving and Retaining Women and Underrepresented Groups in Mathematics, at the Joint Mathematics Meetings in Baltimore, Jan. 16-19, 2019

o Invited poster presentation (with Dr. Tracii Friedman) at the MAA Poster Session: Mathematical Outreach Programs at the Joint Mathematics Meetings in Baltimore, Jan. 16-19, 2019

o *Some geometric proofs of the Pythagorean Theorem* at the Mesa State, Middle School, Math and Science Partnership Professional Development Workshop, John McConnell Math and Science Center, Grand Junction, Colorado, Nov. 7, 2008

o *Teaching College Algebra from a modeling perspective*, (with Dr. Tracii Friedman), 2007 Spring Meeting of the Rocky Mountain Section of the Mathematical Association of America, Colorado State University at Pueblo, April 13-14, 2007

o *Modeling oriented College Algebra* (with Dr. Tracii Friedman) at the Mesa State College Faculty Colloquium, April 4, 2007

o *Progress report on Chapters 5, 10, 11, 12, 13*, Continued Fraction Handbook Workshop IV, Norwegian University of Science and Technology, Trondheim, Norway, August 7-8, 2003

o *Stieltjes continued fractions and special functions*, Conference on Orthogonal Functions and Related Topics, Roros, Norway, August 12, 2003

o *Progress report on Chapter 5*, Continued Fraction Handbook Workshop II, Norwegian University of Science and Technology, Trondheim, Norway, January 27-28, 2003

o *Numerical stability in evaluating continued fractions*, Handbook Project Group, University of Antwerp, May 31, 2001

o *Rational and irrational numbers using continued fractions*, Mesa County School District 51 Conference: Ensuring the Future with Standards and Assessment, Grand Junction, Colorado, February 15, 1999

- *Para-orthogonal Laurent polynomials and the strong Stieltjes moment problem*, Continued Fractions and Geometric Function Theory Conference, Norwegian University of Science and Technology, Trondheim, Norway, June 24, 1997

- *More on natural solutions of indeterminate strong Stieltjes moment problems*, Workshop on Orthogonal Functions, Moment Theory, Pade Approximants and Applications, Universidade Estadual Paulista, Sao Paulo, Brazil, June 26, 1996

- *Observations on indeterminate Stieltjes moment problems*, Analytic Theory of Continued Fractions and Related Subjects Conference, University of Colorado, Boulder, July 27, 1994

- *A special class of indeterminate strong Stieltjes moment problems*, Nonlinear Numerical Methods and Rational Approximation Conference, University of Antwerp, Belgium, September 10, 1993

- *A special class of indeterminate strong Stieltjes moment problems*, Workshop on the Analytic Theory of Continued Fractions and Related Topics, University of Colorado, Boulder, July 22, 1993

- *Discrete distribution functions for log-normal moments*, Workshop on Continued Fractions and Orthogonal Functions: Theory and Applications, Loen, Norway, June 25, 1992

- *Para-orthogonal Laurent polynomials and associated sequences of rational functions*, International Congress on Extrapolation and Rational Approximation, Tenerife, Canary Islands, Spain, January 16, 1992

- *Para-orthogonal Laurent polynomials*, Summer Workshop on Pade Approximants and Continued Fractions, University of Colorado, Boulder, and Colorado State University, July 3, 1991

- *Para-orthogonal Laurent polynomials*, Sixth Annual Southeastern Conference on Approximation Theory, Memphis State University, March 14, 1991

Other Scholarly Activities

- Developed content and delivered an interactive station on knot theory for Math Extravaganza!, February 27, 2020

- Co-Directed GirlsDoMath Summer Camp in 2018 and 2019. Dr. Tracii Friedman and I obtained funding, planned and designed the content materials and activities (different for each camp); coordinated all scheduling and logistics required to host the camp; supervised undergraduate assistants; ran the 2018 camp July 16-20 and a follow-up Math Board Game Night Oct. 29 and ran the 2019 camp June 10-14, and a follow-up Math Board Game Night Dec. 9

- Co-developed three different sets of materials for the faculty development programs that were used at approximately 40 host sites for the 2018(2), 2018(3) and 2019 Student Competition Using Differential Equations Modeling (SCUDEM) that were held on Nov. 9, 2019, October 27, 2018 and April 21, 2018 . See https://www.simiode.org/scudem

Professional Meetings/Workshops Attended

- Joint Mathematics Meetings (meeting was virtual), January 6-9, 2021

- Joint Mathematics Meetings in Denver, January 15-18, 2020

- MAA Minicourse on Visual Complex Analysis GeoGebra Tools and Mapping Diagrams presented

by Martin Flashman at the Joint Mathematics Meetings in Denver, January 15-18, 2020

o Joint Mathematics Meetings in Baltimore, January 16-19, 2019

o MAA Minicourse on How to Run Successful Math Circles at the Joint Mathematics Meetings in Baltimore, January 16-19, 2019

o 2016 Spring Meeting of the Rocky Mountain and Intermountain Sections of the Mathematical Association of America, Colorado Mesa University, April 8-9, 2016

o 2007 Spring Meeting of the Rocky Mountain Section of the Mathematical Association of America, Colorado State University at Pueblo, April 13-14, 2007.

o 2006 Spring Meeting of the Rocky Mountain and Intermountain Sections of the Mathematical Association of America, Mesa State College, April 7-8, 2006

o CRAFTY Workshop: Redesigned College Algebra, Mathematical Association of America, University of New Mexico, Albuquerque, New Mexico, August 1-3, 2005

o 2004 Spring Meeting of the Rocky Mountain Section of the Mathematics Association of America, Colorado College, Colorado Springs, Colorado, April 16-17, 2004

o Conference on Orthogonal Functions and Related Topics, Roros, Norway, August 12-15, 2003

o Continued Fraction Handbook Workshop IV, Norwegian University of Science and Technology, Trondheim, Norway, August 7-11, 2003

o 2003 Spring Meeting of the Rocky Mountain Section of the Mathematics Association of America, United States Air Force Academy, Colorado Springs, Colorado, April 25-26, 2003

o Continued Fraction Handbook Workshop II, Norwegian University of Science and Technology, Trondheim, Norway, January 27-31, 2003

o MAA PREP Workshop on Knot Theory, Wake Forest University, Winston-Salem, North Carolina, June 24-28, 2002

o 2001: A Mathematics Odyssey, Mesa State College, Grand Junction, Colorado, August 6-10, 2001

o Joint Mathematics Meetings in New Orleans, January 10-13, 2001

o 2000 Annual Meeting of the Rocky Mountain Section of the Mathematics Association of America, Colorado State University, Fort Collins, Colorado, April 7-8, 2000

o MATHFEST 99, the 1999 Annual Meeting of the Mathematical Association of America, Providence, Rhode Island, July 31-August 2, 1999

o Continued Fractions, Orthogonal Functions and Related Topics: A Celebration of the 80th Birthday of W.J. Thron, University of Colorado, Boulder, May 26-June 4, 1998

o 1998 Annual Meeting of the Rocky Mountain Section of the Mathematics Association of America, Arapahoe Community College, April 17-18, 1998

o Continued Fractions and Geometric Function Theory, Norwegian University of Science and Technology, Trondheim, Norway, June 24-28, 1997

o 1997 Annual Meeting of the Rocky Mountain Section of the Mathematics Association of America, Metro State College/University of Colorado, Denver, April 11-12, 1997

o Workshop on Orthogonal Functions, Moment Theory, Pade Approximants and Applications,

Universidade Estadual Paulista, Sao Jose do Rio Preto, SP, Brazil, June 19-28, 1996

o 1996 Annual Meeting of the Pacific Northwest Section of the Mathematics Association of America, Reed College, Portland, Oregon, March 9, 1996

o Analytic Theory of Continued Fractions and Related Subjects, University of Colorado, Boulder, July 18-29, 1994

o Nonlinear Numerical Methods and Rational Approximation, University of Antwerp, Belgium, September 5-11, 1993

o Workshop on the Analytic Theory of Continued Fractions and Related Topics, University of Colorado, Boulder, July 19-23, 1993

o Workshop on Continued Fractions and Orthogonal Functions: Theory and Applications, Loen, Norway, June 21-July 4, 1992

o International Congress on Extrapolation and Rational Approximation, Tenerife, Canary Islands, Spain, January 13-17, 1992

o Summer Workshop on Pade Approximants and Continued Fractions, University of Colorado, Boulder and Colorado State University, June 24-July 5, 1991

o Sixth Annual Southeastern Conference on Approximation Theory, Memphis State University, Memphis, March 14-16, 1991

Editor/Reviewer/Referee

o Co-Editor of the mathematics journal *Communications in the Analytic Theory of Continued Fractions* (CATCF). The purpose of CATCF is to provide a convenient means of exchanging information concerning research results by establishing a collection of abstracts and reviews of published or unpublished works within the scope of the journal, 1998-2021

o Reviewer for the mathematics journal *Communications in the Analytic Theory of Continued Fractions*, 1998-2021

o Reviewer for *Chapter 7: Applications of Trigonometric Functions* in the text **College Algebra** by Kaufmann and Schwitters, 2016

o Referee for the paper *A convergence theorem for random continued fractions* for the Journal of Approximation Theory, 2014

o Reviewer/class tester for **Calculus: Early Transcendentals** by Briggs and Cochran, Addison Wesley, 2010. My contributions are acknowledged in the Preface of the text which has recently appeared in print

o Referee for *Computing orthogonal rational functions with poles near the boundary* for Journal of Computers and Mathematics with Applications, 2006

o Reviewer for **College Algebra**, 4th edition, by Stewart, Redlin, Watson for Brooks/Cole Wadsworth Group, May, 2006

o Referee for *A Christoffel-Darboux formula and a Favard's theorem for orthogonal Laurent polynomials on the unit circle* for Journal of Computational and Applied Mathematics, 2004

o Co-Editor of **Proceedings of the Conference 2001 Mathematics Odyssey**, Rocky Mountain Journal

of Mathematics, Summer 2003

o Referee for *Inversely symmetric interpolatory quadrature rules* for Acta Applicandae Mathematicae, October 1999

o Referee for *Remarks on canonical solutions of strong moment problems* for Orthogonal Functions, Moment Theory and Continued Fractions; Theory and Applications, May 1997

o Referee for *Solutions of the strong Stieltjes moment problems* for Methods and Applications of Analysis, February 1995

Service Highlights

Institutional Service. . . . .

o Chair Tenure and Promotion Committee (2020), Retention Committee and Developmental Education Retention Subcommittee (2018-2021), Student Showcase Committee (2017-2021), Faculty Salary and Benefits Committee (2018-2021), Member Tenure and Promotion Committee (2009, 2010, 2011, 2019), Working group for adjusting prerequisites for College Mathematics and College Algebra (2018), Assessment Committee (2017), Distinguished Faculty Selection Committee (2015, 2016), Working group on Faculty Effort Allocation (2015-16), WIGISAS (2011-2012), Part-time Faculty Compensation Committee (2011), HLC Committee Criteria 4 (2011-2013), Student Academic Success Working Group (2010-2011), Panel on Teaching Effectiveness (2007), Commission on Governance (2001-2003), Academic Master Plan Over site Committee (2001-2004), NCA Self-Study Committee on Criterion V: Integrity, (2002-2003), Tenure Committee for School of Natural Sciences and Mathematics (2001-2004), Co-advisor for Ho'o'lokahi Polynesian Club (1997- 2010), Faculty Senate Vice President (2000-2001), Faculty Senate (1997-2001), FACT Faculty Advisors to the Trustees (2000-2001), Technology Council (1999-2000)

Departmental Service. . . . .

o Mathematics Program Review Co-chair (2020-2021), Math Program Working Group (2015-2021), CSMS Pre-tenure Committee (2009-2021), Co-organizer for spring and fall Mathematics Colloquiums (2019), Senior Seminar Revision Committee (2018-2019), Chair CSMS Faculty Evaluation Guideline Committee (2018), Outstanding Mathematics Graduate Selection Committee (2006-2020), Mathematics and Applied Mathematics Tenure-Track Search Committee (2017-18, 2014-2015), Math/Stat Instructor Search Committee (2017), Chair Math/Stat Instructor Search Committee (2016), Math Program Review Committee (2014-2015), Committee for establishing criteria for graduating with honors in mathematics (2014-2015), Mathematics Search Committee (2014-2015), Statistics Search Committee (2012-2013), Chair Math Placement Committee (2011- 2012), Mathematics Search Committees (2010-2011, 2009-2010, 2001-2002), Chair Mathematics Education Search Committee (2004-2005)Organize reception for mathematics graduates (2002- 2020), Chair Mathematics Program Review (2008), Math Minor Revision Committee (2007-2010)countless textbook committees

Professional Service. . . . .

o Co-Editor/Reviewer of the mathematics journal Communications in the Analytic Theory of Continued Fractions (1998-present)

o Member of Organizational Committee for the joint 2016 Spring Meeting of the Rocky Mountain and Inter-mountain Sections of the MAA

o Member of Nominating Committee for Rocky Mountain Section of the Mathematical Association of America (2011-2013)

- o Chair of Nominating Committee for Rocky Mountain Section of the Mathematical Association of America (2012)
- o Chair of Organizational Committee for the joint 2006 Spring Meeting of the Rocky Mountain and Intermountain Sections of the MAA
- o Co-Organizer for the international conference 2001 Mathematics Odyssey, Mesa State College, August 2001
- o Co-Organizer for the international conference Continued Fractions, Orthogonal Functions and Related Topics, University of Colorado, Boulder, May 26-June 4, 1998

Outreach. . . . .

- o Knot theory station for Math Extravaganza!, our mathematics outreach event that brings 150 high school students from the region to campus for a day of fun math activities, February 27, 2020
- o *GirlsDoMath Summer Camp,* Colorado Mesa University, July 2018, June 2019
- o *Career Cafe,* Redlands Middle School, November 2017
- o *The Golden Ratio,* Redlands Middle School, March 2016
- o *Math is Everywhere,* Wingate Elementary School, October 2013
- o *My Job as a University Math Professor,* Wingate Elementary School, October 2011
- o Cohort group participant for *A Match Made in Standards*, a program to provide local elementary teachers with specific mathematics content, 1999-2000
- o Mentor for *Partnership Masters Program* for three women who were working on their masters degrees in elementary education with an emphasis in mathematics, 1998
- o As a member of Delta Kappa Gamma Society International, an honor society for teachers, I participate in fund raising activities for a scholarship that is awarded annually to a woman who is seeking a degree in education at CMU. For several years I lead that scholarship effort by advertising the scholarship, collecting applications and recommending a recipient, 1998-present

Community Service. . . . .

- o Western Colorado Science Fair judge (2001, 2003, 2005, 2012-2014)
- o Parent volunteer at Wingate Elementary School (2011-2015)
- o Member Wingate Elementary PTA (2011-2013)
- o Member Western Rockies Federal Credit Union Scholarship Selection Committee (2010-2013)
- o Member Board of Directors or Little Mavericks Learning Center (2008-2009)
- o Member Advisory Committee, Western Rockies Federal Credit Union (2002-2008)
- o Member Interview and Selection Committee for Boettcher Scholarship (2001, 2002). The Boettcher Scholarship is one of the most prestigious merit-based scholarships in the state of Colorad

Curriculum Vita

Dr. Edward K. Bonan-Hamada
Associate Professor
Department of Computer Science, Mathematics and Statistics
Colorado Mesa University

Education
- **Ph.D.** University of Colorado, Boulder 1996 Mathematics
  Dissertation: *A Bounded Compactness Theorem for L^1-embeddings*
  Advisor: Jerome Malitz
- **M.A.** University of Hawai'i, Manoa 1985 Mathematics
  Advisor: Dale Meyers
- **B.A.** University of Rochester 1977 Biology

Academic Positions
- **2001 - present Associate Professor**, Department of Mathematics, and Statistics, Colorado Mesa University, Grand Junction, Colorado
- **1997 - 2001 Assistant Professor**, Department of Computer Science, Mathematics, and Statistics, Mesa State College, Grand Junction, Colorado
- **1996 - 1997 Adjunct Professor**, Department of Computer Science, Mathematics, and Statistics, Mesa State College, Grand Junction, Colorado
- **Summer 1996 Lecturer**, Department of Mathematics, Western Oregon State College, Monmouth, Oregon
- **Spring 1996 Lecturer**, Department of Social Sciences, Western Oregon State College, Monmouth, Oregon
- **1989 - 1994 Graduate Teaching Assistant**, Department of Mathematics, University of Colorado, Boulder, Colorado
- **1985-1988 Lecturer,** Department of Mathematics, University of Hawai'i, Manoa, Hawai'i
- **1980-1984 Graduate Teaching Assistant**, Department of Mathematics, University of Hawai'i, Manoa, Hawai'i

Courses Taught
- **Colorado Mesa University**: Intermediate Algebra (MATH 091), College Mathematics (MATH 110), College Algebra (MATH 113), Trigonometry (MATH 130), Precalculus (MATH 119) Calculus for Business (MATH 121), Calculus for the Biological Sciences (MATH 146), Introduction to Computer Algebra Systems (MATH 147), Calculus I (MATH 151), Calculus II (MATH 152), Calculus III (MATH 253), Computational Linear Algebra (MATH 225), Introduction to Advanced Mathematics (MATH 240), Mathematical Modeling (MATH 365), Discrete Structures I (MATH 369), Discrete

Structures II (MATH 370), History of Mathematics (MATH 380), Geometries (MATH 386), Independent Study (MATH 395), Abstract Algebra for Secondary Education (MATH 415), Introduction to Topology (MATH 420), Computational Abstract Algebra (MATH 425), Mathematical Logic (MATH 430), Complex Variables (MATH 450), Abstract Algebra I (MATH 490), Abstract Algebra II (MATH 491), Introduction to Statistics (STAT 200)
Topics: Computational Mathematical Biology, Logic for Computer Science, Mathematical Logic
Western Oregon State College: Statistics for the Social Sciences, College Algebra
University of Colorado: Calculus I, Calculus II, Calculus III, Quantitative Reasoning and Mathematical Skills 1010, lab tutor Math Modules, University Learning Center Instructor for Intermediate Algebra and College Algebra
University of Hawai'i: College Algebra I and II, Calculus I, Calculus II

Grants

Faculty Development Grant (2019): This grant was used to purchase an EMOTIV EEG headset to become acquainted with the emerging technology that allows investigation using over-the-counter product to study human cognition as it relates to human reasoning and mathematical practice.
OSC Professional Development Fund (1998-1999): The stipend was used to study theories of truth and their role in the foundations of mathematics
OSC Joint Activities Fund (2000-2002): Part of this grant was used to support activities that linked MSC science and mathematics programs to the MESA/GOAL 5 partnership, which tries to interest District 51 middle school students in mathematics and science. The rest was used to fund the MCM competitions and promote the computational science concentration.
OSC Special Incentive Fund (2000-2002): Stipends for students working on projects, demonstrations and workshops were funded by this grant. Out of this, two workshops were given for middle school students at the Western Slope Science and Mathematics Center; one in chemistry and the other in robotics. Students that were part of this program put on the chemistry workshop. The robotics workshop featured Drs. Macevoy, McCallister and Rybak who were interviewed on local television stations. Students involved in the projects also created displays for the Western Slope Science and Mathematics Center one of which was cellular automata simulation software
.

Conferences/Workshops Attended

2008 Workshop on Logic, Language, Information and Computation, Heriot-Watt University, Edinburgh, Scotland, UK
2007 Spring Meeting of the Rocky Mountain Section of the MAA, CSU-Pueblo, Pueblo, Colorado

2006 Spring Joint Meeting of the Rocky Mountain and Intermountain Sections of the Mathematical Association of America, Mesa State College, Grand Junction, Colorado
2004 Spring Meeting of the Rocky Mountain Section of the Mathematical Association of America, April 16-17, 2004, Colorado College, Colorado Springs, Colorado
2003 Spring Meeting of the Rocky Mountain Section of the Mathematical Association of America, April 25-26, 2003, United States Air Force Academy, Colorado Springs, Colorado
Java Workshop, April 25, 2003, United States Air Force Academy, Colorado Springs, Colorado
North American Summer School in Logic, Language and Information (NASSLLI), June 2003, Stanford University, Palo Alto, California
State Colleges in Colorado Fall 2001 Professional Development Conference, September 28-29, Holiday Inn, Frisco, Colorado
2001: A Mathematics Odyssey, August 6-10, 2001, Mesa State College, Grand Junction, Colorado
2001 Joint Mathematics Meetings, January 10-13, 2001, New Orleans, Louisiana
State Colleges in Colorado Fall 2000 Professional Development Conference, September 29-30, Holiday Inn, Frisco, Colorado
2000 Summer Meeting of the Association for Symbolic Logic, June, University of Illinois, Champaign-Urbana
2000 Annual Meeting of the Rocky Mountain Section of the Mathematics Association of America, April 7-8, 2000, Colorado State University, Fort Collins, Colorado
1998 Annual Meeting of the Rocky Mountain Section of the Mathematics Association of America, April 17-18, 1998 Arapahoe Community College
1997 Annual Meeting of the Rocky Mountain Section of the Mathematics Association of America, April 11-12, 1997, Metro State College/University of Colorado, Denver

Talks Given

2018 MathFest, Denver, Colorado *Developing a growth mindset using TRIUMPHS PSP*
2018 MAA Rocky Mountain Sectional Meeting, UNC, Greely, Colorado *Developing a growth mindset using TRIUMPHS PSP*

Other Scholarly Activity

Continuing Study/Research: Since 2000, I have continued to explore the question of 'mathematical cognition' from several directions: cognitive science, mathematical logic, and the philosophy of mathematics. The core questions I have explored and continue to do so are: 'what cognitive mechanisms underlie mathematical practice?', 'what are

the logical systems of those cognitive mechanisms that give rise to mathematical intuition and its resulting practice?', 'why is mathematics useful and how does mathematics correspond to *reality*?'.

In the area of cognitive science a sampling of books I have been working through include: Stenning and van Lambalgen's *Human Reasoning and Cognitive Science*, Sophian's *The Origins of Mathematical Knowledge in Childhood, Emerging Perspectives on Gesture and Embodiment in Mathematics* edited by Edwards, Ferrara and Moore-Russo, Dehaene's *The Number Sense*, Siegel's *Mind*, Lakoff and Nunez' *Where Mathematics Comes From.*

Some of the material I have studied and often revisit in the mathematical realm beyond material I use for my MATH 430 and 369 classes includes: Button and Walsh's *Philosophy and Model Theory*, Priest's *An Introduction to Non-Classical Logic, 2nd. Ed*, *Between Logic and Reality*, edited by Trobok et.al., Varzi's *An Essay in Universal Semantics*, Fagin et.al. *Reasoning About Knowledge*, and Aggarwal's *Neural Networks and Deep Learning*.

Attempted Research Project, 2019: An IRB approved interdisciplinary research project was attempted with Professor of Psychology Dr. Susan Becker and Assistant Professor of Psychology Dr. Jeremy Tost, that would look at the effectiveness of supporting affect in students trying to learn mathematics. The Pandemic shutdown ended our work in this.
Participated in 2017 TRIUMPHS Workshop, UC Denver**:** This was a two-day workshop for getting participants more familiar with the use of TRIUMPHS PSP.
Participated in TRIUMPHS Project: Teaching the History of Mathematics from a Historical Perspective is an NSF-funded project focused on using primary sources to teach the history of mathematics. I have used several of the Primary Source Projects (PSP) as part of the instruction in MATH 380, History of Mathematics, and MATH 386, Geometries. Data collection for the student participation was done and I was required to get CITI certification.
Directed Student Research: I have directed Senior Research Projects for thirteen mathematics majors. Recent projects are focused on subsystems of mathematics that reflect cognitive models of human reasoning about mathematics.

Service Highlights

- **Member of the Wellness Committee:** One of the original and continuing members of a group charged with improving the "wellness" of the greater CMU community. My contribution to the activities has been several workshops for CMU community members to learn about Tai Chi, meditation and stress reduction.
- **Member of the CMU Campus Safety Group:** Served as the faculty liaison on the Campus Safety Group which has helped the CMU campus to better prepare for emergency situations. Events have included participation in workshops by John Niccoletti, an expert on school shootings, and Alon Stivi, founder of Active Countermeasures Training (ACT).

District 51 Vertical Alignment Team: Served as the Mesa State College representative on a team of District 51 teachers attempting to align the mathematics curriculum.

SWARM Conference: I produced the "What is Mathematics" session of the SWARM Conference held at MSC and brought in the keynote speaker for the conference, Dr. Keith Devlin.

Advisor Mathematical Contest in Modeling (1998-2003): 1998 was the first year that MSC fielded a team to compete in the MCM, an international competition where students attempt to create a mathematical model of real-life problems in a weekend. Over the years MSC teams have garnered four Honorable Mentions and one Meritorious ranking.

Member of the GOAL5/MESA Partnership (1997-2001): This business-education partnership with District 51 was committed to improving the participation of students in mathematics, science and engineering by providing opportunities for middle school students to participate in mathematics, science and engineering activities.

Cathleen Farrell

EDUCATION

The University of Florida   Gainesville, FL

Master of Geomatics   2016

Florida Atlantic University   Boca Raton, FL

Master of Mathematics   1993

Florida Atlantic University   Boca Raton, FL

Bachelor of Mathematics   1991

EXPERIENCE

Mathematics Professor

Colorado Mesa University   Grand Junction, CO

- Teaching College Algebra to Calculus   2016 - Present

Mathematics Professor   Davie, FL

Broward College   2014 – 2016

Teaching classes from Basic Algebra to Calculus and Differential Equations

Serving on committees such as textbook committees

Chair of Mathematics Department   Davie, FL

Broward College   2005 - 2014

Responsible for creating, maintaining and monitoring the course schedule and enrollment

Responsible for mediating all student, faculty and staff disputes

Attend weekly Dean's Meetings and College functions

Interview, hire and mentor part time and full time faculty and staff

Supervise, evaluate and observe faculty

Advise students

Order textbooks, software and supplies

Teach two classes per year

Mathematics Professor   Davie, FL

Broward College   1993 – 2005

Taught classes from Basic Algebra to Calculus and Differential Equations

Served on committees such as textbook committees, hiring committees, final exam committees, course review committees, and health and safety committees

Clay King, Ph.D.

Education

Aug 2014 – May 2018	Baylor University	Waco, Texas

Ph.D in Statistics

- Teacher of Record in statistics department (2014 – 2016) and business school (2016 – 2017)
- Dissertation research topics include Bayesian methods, quantile regression, and spatial statistics applied to count and semi-continuous data
- Coding proficiency in R, SAS, BUGS, JAGS, JMP, and Mathematica

June 2012 – Dec 2013	Texas A&M University – Central Texas	Killeen, Texas

Master of Science in Mathematics

- Graduated with a 4.0 GPA

May 2007 – Aug 2008	Baylor University	Waco, Texas

Master of Science in Education

- Part of the Strickland Scholars Program
- Taught and coached at Mart High School while enrolled in the program

Aug 2003 – May 2007	Austin College	Sherman, Texas

Bachelor of Arts in Mathematics

- Minor in Psychology
- 3.7 cumulative GPA
- 4-year member of varsity baseball team

Aug 1999 – May 2003	Midway High School	Waco, Texas

Diploma

- Graduated 9 of 400

Professional Experience

Aug 2017 – present   Colorado Mesa University   Grand Junction, Colorado

Assistant Professor of Statistics

- Courses taught: Probability and Statistics, Statistics for Social and Behavioral Science, Statistics for Business, Computational Statistics, Correlation and Regression, Sampling Design, Design and Analysis of Experiments, Categorical Data Analysis, Time Series Analysis
- Offer 5 office hours per week
- Advisor for 4 to 6 statistics majors at any given time
- Have supervised 8 senior research projects

Aug 2014 – May 2017   Baylor University   Waco, Texas

Graduate Student Teacher of Record

- Taught 4 semesters of STA 1380; topics taught include descriptive statistics, discrete and continuous probability distributions, confidence intervals, one and two sample hypothesis testing, chi-square goodness of fit tests, and simple linear regression
- Taught QBA 2302 and 2305; topics include those in STA 1380 as well as probability, multiple regression, logistic regression, experimental design, one and two-way ANOVA, contingency table analysis, and nonparametric methods
- Offered a minimum of three office hours per week to students

Aug 2012 – Aug 2014   McLennan Community College   Waco, Texas

Math Instructor

- Taught a minimum load of 15 hours per semester in face-to-face and online formats, including Developmental Algebra, College Algebra, Introductory Statistics, Pre-calculus, and Calculus
- Provided student advising assistance as needed
- Offered a minimum of one hour of open office hours daily to students
- Participated in multiple committees, including course development and implementation and departmental final exam creation
- Attended monthly departmental meetings and performed other duties as assigned

Oct 2011 – Aug 2012   McLennan Community College   Waco, Texas

Senior Lab Instructor and Adjunct Developmental Math Instructor

- Taught one developmental math class per semester
- Provided tutoring services in a walk-in setting in the college mathematics lab, covering topics from basic arithmetic through calculus

Supervised student workers

Aug 2008 – June 2011   Midway High School   Waco, Texas

Geometry Teacher

- Cross country and track coach (Aug 2008 – May 2009)
- Taught 5 geometry classes per year and provided math tutorials during one class period as well as before and after school
- Communicated with students, parents, fellow teachers, coaches, and administrators via email, telephone, and face-to-face conferences
- Collaborated with coworkers to establish curriculum, assignments, and grading policies during weekly planning meetings
- Utilized online grade management systems, electronic databases, and the Microsoft Office suite

Aug 2007 – June 2008   Mart High School   Mart, Texas

Algebra 1 and Geometry Teacher

- Assistant baseball coach
- Balanced teaching, coaching, and attending graduate school classes two nights per week
- Taught 3 Algebra 1 classes, 3 Geometry classes, and 1 TAKS math preparation class
- Designed and implemented entire Algebra 1 and Geometry curriculum, from establishing scope and sequence to determining assignments and writing tests

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Publications and Presentations

- Jones, J., King, C., and Parker, R. (2021), The impact of the COVID-19 pandemic on NCAA Division II soccer players' perception of burnout, *Under review*.
- King, C., and Stamey, J.D. (2021), Sample size determination for a Bayesian cost-effectiveness model with structural zero costs, C*ommunications in Statistics – Simulation & Computation*, DOI: 10.1080/03610918.2021.1901916.
- Kennard, D., Matlaga, D., Sharpe, J., King, C., Alonso-Rodriguez, A., Reed, S., Cavaleri, M., & Wood, T. (2020), Tropical understory herbaceous community responds more strongly to hurricane disturbance than to experimental warming, *Ecology and Evolution, 10(*16*),* 8906-8915.
- King, C., & Song, J. J. (2019). A Bayesian two-part quantile regression model for count data with excess zeros. *Statistical Modelling*, *19*(6), 653–673.
- King, C., and Song, J.J. (2019), Bayesian spatial quantile regression for areal count data,

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with application on substitute care placements in Texas, *Journal of Applied Statistics*, *46(4)*, 580 – 597.

- King, C., "A two-part Bayesian approach to quantile regression for count data with excess zeros." Joint Statistical Meetings, 30 July 2019, Denver, Colorado. Speed and poster presentation.
- King, C., "Bayesian spatial quantile regression for areal count data, with application on substitute care placements in Texas." Joint Statistical Meetings, 1 August 2018, Vancouver, British Columbia, Canada. Speed and poster presentation.

Service

- Article Reviewer, *Quantitative Science Studies*, Spring and Summer 2021
- Chair, Instructor of Mathematics search committee, Spring 2021
- Article Reviewer, *Journal of Agricultural, Biological, and Environmental Statistics*, Fall 2020 – Summer 2021
- Article Reviewer, *The American Statistician*, Fall 2020
- Assistant Professor of Applied Math search committee, Spring 2020
- Designed and taught Computational Statistics as a new course to the university, Fall 2019
- Faculty Success Committee, August 2018 – present (Secretary August 2018 – August 2020)
- Mesa Experience department representative, October 2019
- Math Extravaganza station leader, February 2019
- Math Program Working Group subcommittee for senior seminar redesign, Fall 2018 – Spring 2019
- Central High School AP Statistics survey project, December 2018
- Modification of Statistics concentration, Fall 2018
- Statistics department representative to the Graduate Student Association, Fall 2016 – Spring 2017

Awards Received

- Exceptional Faculty Evaluation Merit Award, Colorado Mesa University, 2018, 2019, 2020, and 2021
- Baylor University Graduate School Fellowship, 2014 – 2017
- Outstanding Graduate Teacher of Record, Baylor University Statistics Department, 2016
- Graduated Magna cum Laude from Austin College, 2007
- Bo Miller Scholar Athlete Award: highest graduating male athlete GPA, 2007
- Who's Who Among Students in American Universities & Colleges, 2005
- National Merit Scholar Finalist, 2003

LISA DRISKELL

Colorado Mesa University

Department of
Mathematics 1100 North Avenue Grand
Junction, CO 81501

(970)248-1824

ldriskel@coloradomesa.edu

Education

Purdue University	**West Lafayette, IN**
Ph.D., Mathematics	*August 2010*
Advisor: Gregery Buzzard	
Central Michigan University	**Mount Pleasant, MI**
B.S., Mathematics	*December 2003*

Academic Positions

Colorado Mesa University	**Grand Junction, CO**
Department Head for Mathematics and Statistics	*Aug 2019 – present*
Colorado Mesa University	**Grand Junction, CO**
Associate Professor of Mathematics	*Aug 2016 – present*
Colorado Mesa University	**Grand Junction, CO**
Assistant Professor of Mathematics	*Aug 2010 –2016*
Educational Service Unit No. 11	**Holdrege, NE**
Summer Honors Program Instructor, Residential program for gifted students.	*June 2014, June 2015*
Central Michigan University	**Mount Pleasant, MI**
Visiting Scholar, NSF funded Research Experience for Undergraduates.	*Summer 2013*
Purdue University	**West Lafayette, IN**
Graduate Research Assistant	*2009–2010*
Purdue University	**West Lafayette, IN**
Graduate Teaching Instructor	*2006–2009*
Central Michigan University	**Mount Pleasant, MI**
Concurrent/Graduate Teaching Instructor	*2003–2004*

University Teaching Experience

Colorado Mesa University *2010 - present*

   19 distinct courses; mathematics courses at all (undergraduate) levels

Purdue University *2006 - 2009*

   Algebra & Trigonometry I, Introductory Analysis I & II (Business Calc I & II)

Central Michigan University *2003 - 2004*

   Intermediate Algebra

Publications

Peer-Reviewed. . . . .

"1-38-T-Ebola, Ebola Outbreak in West Africa." *SIMIODE: Systemic Initiative for Modeling Investigations and Opportunities with Differential Equations*, https://www.simiode.org/resources/2722 (2016). Supporting document: "1-38-T-Excel-DataEbolaOutbreakWestAfrica," a file containing comprehensive data from WHO, compiled and organized by L. Driskell.

"1-110-T-SnailsInaTidePool, Snails in a Tide Pool," with Audrey Malagon. *SIMIODE: Systemic Initiative for Modeling Investigations and Opportunities with Differential Equations,* https://www.simiode.org/resources/2925 (2016).

"Adding Movement to Velocity Explorations," with A. Malagon. Book chapter/section in *Tactile Learning Activities in Mathematics: A Recipe Book for the Undergraduate Classroom*, edited by J. Barnes and J. Libertini (pp 43-47). MAA Press, an imprint of the American Mathematical Society (2018).

"Keychain Ziplines: A Practical Way to Study Velocity in the Calculus Classroom," with A. Malagon. *PRIMUS: Problems, Resources, and Issues in Mathematics Undergraduate Studies*, 23:7 (2013), 590-597, DOI: 10.1080/10511970.2013.801383. A PRIMUS Hot Topic Article in 2014.

"Wavelet-Based Steganography," *Cryptologia*, XXVIII:2 (2004), p 157–174.

Manuscripts. . . . .

"A simplified two-variable model for cardiac tissue," in preparation.

"Lake Mead Temperature Modeling," with undergraduate students Kelsey Marcinko and Catherine Schepp. Printed in the Central Michigan University 2013 REU Final Reports Booklet (2013).

Awards, Grants, and Fellowships

Colorado Mesa Univ Faculty ProfDev Grant	*awarded in Fall 2012, 2013, 2014, 2016, 2018, 2019*
Colorado Mesa Univ Exemplary Faculty Award	*calendar years 2013, 2014, 2016, 2017, 2018*

MAA travel grant for travel to MAA MathFest	*2018*
SIMIODE East Developer Workshop, invitation and funding	*2015*
Mathematical Association of America PREP IBL Workshop Travel Grant	*2015*
Mathematical Association of America Project NExT Fellow	*2011 -*
Purdue Women in Science Program Travel Grant	*2010*
American Mathematical Society Graduate Student Travel Grant	*2010*
Purdue Research Foundation Research Grant	*2009 –*
Purdue University Program in Quantitative Physiology Scholar	*2008 –*
Purdue Graduate School Summer Research Grant	*2008*
GAANN Fellowship	*2004 –*
Cryptologia Annual Greg Mellen Memorial Cryptology Paper Scholarship	*2004*
Central Michigan University Honors Program Summer Research Scholarship	*2003*
Richtmeyer-Foust Outstanding Senior in Math Award	*2003*
Serier Endowed Memorial Scholarship for an Outstanding Mathematics Major	*2002*
Central Michigan University Centralis Gold Award	*1999 –*

SIMIODE East Developer Workshop, Virginia Beach, VA	*July 2015*

Three-day workshop to begin development of classroom modeling projects

Inquiry Based Learning Workshop, San Luis Obispo, CA	*July 2015*

Four-day professional development workshop, sponsored by MAA PREP

MAA Short Course on Conceptual Climate Models, San Diego, CA	*January 2013*

Two-day course on conceptual climate modeling research and coursework

MAA Project NExT (New Experiences in Teaching), Peach11 Cohort	*2011-2012*

Multi-semester professional dev program involving several workshops

Professional Service Activities. . . . .

Mathematical Association of America Council on the Profession;	Member	*2020 –*
MAA Committee on Early Career Mathematicians;	Chair	*2019 –*
MAA Committee on Early Career Mathematicians;	Member	*2017 – 2019*
SIMIODE Board of Contributing Advisors;	Member	*2013 –*

Joint Mtg of the Rocky Mtn and Intermtn Sections of the MAA	Member	*2015 – 2016*
PRIMUS	Reviewer	*2013 – 2019*
SIMIODE	Reviewer	*2013 – 2016*

Memberships (current)

Camp Hope Board of Directors, (non-profit 501(c)(3))	*2019 - present*
Mathematical Association of America	*2011 – present*
Kappa Mu Epsilon, Local Chapter	*2010 – presen*

Curriculum Vitae

Fischer, Marc

	Job Experience
Aug. 2011 – Present	Instructor of Mathematics Colorado Mesa University • Mathematics courses include: College Algebra, Calculus I II and III, Differential Equations and Linear Algebra. • Computer Science Courses: Computer Science for Engineers, Webpage design I
Nov. 2010 – Aug. 2011	Substitute Teacher Elsa Brändström Gymnasium, High School in Oberhausen Germany • Grades 7 to 11 • Subjects mathematics, physics and computer science
Jan. 2007 – Sep. 2007	Application Engineer GPD-Global, Grand Junction, CO, USA • Development of production steps and implementation into existing production lines. • Programming of dispensers. • Compiling reports and writing presentations. • Presentations at international trade fair shows.
Aug. 2007 – Jan. 2007	International Sales Assistant Walker Products, Grand Junction, CO, USA • Technical support and sales for car aftermarket parts. • Implementation of a database for TS16949 certification.
Oct. 2005 – May 2006	Loan Officer U.S. Small Business SBA, Sacramento, CA, USA • Processing of disaster loan applications.
Aug. 2000 – May 2005	Customer Service, Trainer, Quality Assurance, Supervisor Startek Inc., Grand Junction, CO, USA • Trainer for new employees. • Quality control for phone support. • Support desk and de-escalation. • Development of a database to track call and support information.
Sept. 1999 – June 2000	Military Service 1.Fernmelderegiment 990, Essen • Administrative duties, career planning and scheduling.

Studies

Oct. 2007 –
July. 2011

Ruhr Universität Bochum
    Master of Science in mathematics
- Focus: Numeric
- Minor: Physics

Aug. 2000 –

May 2005

Mesa State College, Grand Junction, CO, USA
    Bachelor of Science in mathematics
- Subsidiary subjects: Physics and computer science

Languages

- Native language: German
- Proficient: English

Interests

- Photography, mountain biking, piano

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Mülheim, 05. January 2011

Curriculum Vitae

Theresa (Tracii) Friedman

Colorado Mesa University, CSMS Dept. 1100 North Avenue, Grand Junction, CO
81501 (970) 248-1667 · tfriedma@coloradomesa.edu

Education

Lehigh University, Bethlehem, PA

Ph.D. in Mathematics, Functional Analysis: July 1997

M.S. in Mathematics: May 1994

Saint Joseph's University, Philadelphia, PA

B.S. in Mathematics: May 1992; Minor: English

Professional Experience

Academic
Positions………………………………………………………………………………..…..

Colorado Mesa University (formerly Mesa State College), Grand Junction, CO

Professor, 8/08-present; Associate Professor, 8/02-8/08

Willamette University, Salem, OR
Assistant Professor, 8/01-5/02

Benedictine University, Lisle, IL

Associate Professor, 8/00-5/01, Assistant Professor, 8/97-8/00

Sabbatical…………………………………………………………………………………...…
……. **Colorado Mesa University,** Grand Junction, CO

Dynamical Systems, Spring 2015

Courses   Taught   at   Colorado   Mesa
University………………………………………………………………

Real Analysis I & II, Abstract Algebra I & II, Topology, Topics in Combinatorics & Graph Theory, Senior
Capstone, Complex Variables, Introduction to Dynamical Systems, Linear Algebra, Introduction to
Advanced Mathematics, Topics and Careers in Mathematics, Calculus I & II, Honors Calculus,
Mathematics Colloquium, Precalculus, Trigonometry, Honors Mathematics, College Algebra (traditional,
modeling, and online), College Mathematics, Mathematical Investigations

o   Redesigned our entry-level mathematics course (Mathematical Investigations) for non-STEM majors from a traditional lecture-based course to a modified flipped classroom with daily class activities and projects that are focused on real-world applications (Fall 2020)

   Coordinate 10-14 sections per semester

- Create daily class activities, weekly assignments, projects, and rubrics for use in all sections
- Built Master Course in Brightspace (course management system) that I regularly revise and update for use in all sections
- Developed Master Homework Assignments in Lumen OHM (online homework system) for use in all sections
- Lead weekly content and pedagogy training for all course instructors and supply a weekly written Instructor Guide outline instruction for the upcoming week
- Extensively revised open-source text to customize for our course

Curriculum Development

(cont'd)………………………………………………………………………………………

o   Substantially reworked courses to accommodate online and hybrid teaching and learning, requiring regular and substantial teaching innovation and technological adaptations (2020)

o   Completely restructured our Senior Capstone course from a two-semester sequence for math majors with concentrations in mathematics or statistics to a one-semester course that is required for all five of our concentrations; developed all content and assessments (Fall 2019)

o   Additional Course Development includes the creation of a Freshman Seminar for Math Majors, an Introduction to Dynamical Systems course, and an online College Algebra course as well as the development of a College Algebra course from modeling approach

Technology Incorporated

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o   Matlab, Maple, Gyro, Geogebra, Excel, PowerPoint, Word, LaTeX, Brightspace Course Management System, Online Homework Systems (MyMathLab, WebAssign, and Lumen OHM), Graphing Calculators, Zoom, Teams, JamBoard

Honors and Awards (Selected)

o   MSC Exemplary Faculty Award, 2020, 2019, 2016, 2006
o   Nominated for Distinguished Faculty Award: Fall 2017, Fall 2015
o   Sabbatical Leave, Spring 2015
o   MSC Outstanding Achievement in Advising Award, 2008
o   Dixson Scholar and Mentor Award, 2004-2005
o   Project NExT Fellow, (original) Peach Dot, 1997
o   Kappa Mu Epsilon Honor Society, 1998
o   Sigma Xi Scientific Research Society, 1997

- o   Lehigh University Graduate School Fellow, 1995-1996
- o   Pi Mu Epsilon Honor Society, 1992

Grant Involvement

- o   **MAA Tensor Women and Mathematics Grant**; Principle Co-investigator; $6000 each year; Supporting GirlsDoMath Camp; 2018-19; 2019-20; 2021-2022

- o   **Professional Development Grants**, Colorado Mesa University; Spring 2010; Fall 2018; Fall 2019
- o   **MAA "Renewal of College Algebra" Grant**; $2000; Support for Final Report; Fall 2008
- o   Selected participant in the **Mathematical Association of America's NSF Grant "Renewal of College Algebra;"** $5000 awarded; Co-director at Mesa State College; 2005 – 2006
- o   **OCEPT (Oregon Collaborative for Excellence in the Preparation of Teachers) NSF Grant**; $5 million distributed over 5 years; Director of my university's participation—last year of the grant; 2001
- o   **Benedictine University Faculty Research Grant**; $1900; Principle Investigator; Summer 2000
- o   **U.S. Department of Education Title III Grant**; $1.8 million distributed over 5 years; Contributing Writer and Investigator; 2000
- o   **NALCO Faculty Research Grant**; $10,000; Principle Investigator; Summer 1999

Publications and Presentations

Publications…………………………………………………………………………………………………..
…...

- o   *Modeling-Oriented College Algebra at Mesa State College*, with C. Bonan-Hamada, <u>Partner Discipline Recommendations for Introductory College Mathematics and the Implications for College Algebra,</u> Mathematical Association of America, 2011.
- o   *Combinatorial Identities by Way of Wilf's Multigraph Model*, with P. Klingsberg, <u>International Journal of Mathematics and Mathematical Sciences</u> Vol. 2006, Article ID 96327, 2006.
- o   *Relating Strictly Singular and Strictly Cosingular Operators to the Condition* X < Y mod **(S,T)**. <u>Analysis</u> Vol. 22, 347-354, 2002.
- o   *Cycles in Random Permutations*, with W.L. Corp and P. Klingsberg, <u>Pi Mu Epsilon Journal</u> Vol. 11 No. 6, 299-305, 2002.

Presentations
(Selected)……………………………………………………………………………………….…...

- o   *A Quantitative Reasoning Course Redesign* (MAA Mathfest, August 2021)
- o   *The Nature of Mathematics: An Introduction to the Major* (Rocky Mountain Section Meeting, April 2021)
- o   *Shifting the Culture: Actively Engaging Students in Introductory Service Courses* (AMS-MAA Joint Meetings, January 2020; with L Driskell)
- o   *GirlsDoMath in Western Colorado* (AMS-MAA Joint Meetings, January 2020; with C Bonan- Hamada)
- o   *Special Invited Session-GDM Highlights* (AMS-MAA Joint Meetings, January 2020; with C Bonan-

Hamada)

o *The Hardest Simplest Math Problem* (Invited Keynote Address, CMU Math Extravaganza; February 2020)
o *GirlsDoMath Summer Camp at Colorado Mesa University* (AMS-MAA Joint Meetings, January 2019; with C Bonan-Hamada)
o *GirlsDoMath in Western Colorado* (Invited MAA Poster Presentation: AMS-MAA Joint Meetings, January 2019; with C Bonan-Hamada)
o *GirlsDoMath Summer Camp at Colorado Mesa University* (Rocky Mountain Section Meeting, April 2019)
o *The Collatz Conjecture*: CMU Mathematics Colloquium: November 2017
o *Fractals- A New Dimension*. Invited MavTalk: April 2016
o *Dynamical Systems*: Presentation to the CMU Board of Trustees: March 2016
o *Taking the Koch Curve to a New Dimension*. Invited CMU Math Extravaganza! Keynote Address: February 2016
o *Topics in Dynamical Systems.* CMU Mathematics Colloquium: October 2015

Supervision of Student Research

o Supervised over 20 undergraduate research projects including three that received Outstanding Presentation Awards, three that were grant supported, and one that resulted in a publication.
o Created the Senior Capstone Course at CMU and have been course instructor for multiple semesters.
o Invited to organize and lead the workshop: *Supervision of Undergraduate Research How to Cultivate a Successful Undergraduate Research Program.* MAA Regional Meeting, Mesa State College: April 2006.

Supervision of Middle/High School Outreach Events

o **GirlsDoMath Summer Enrichment Camp** Co-Director (2018, 2019)

Created, organized, and developed all aspects of a week-long summer enrichment camp in mathematics for middle school girls.

Developed substantial mathematics content (different each year) and research projects for middle school camp and supervised three research groups each year.

Planned and hosted free spring (colloquium and pizza) and fall (Math games and pizza) events each year for our summer camp participants.

Managed the $6500 budget for the camp

o **Math Extravaganza! Annual High School Enrichment Day** Faculty Coordinator and Lead Organizer (2005-2011)

Grew this event from approximately 40 students participating to approximately 130 during my leadership

Created 20-minute fun, mathematics enrichment activities on topics not typically taught in high school such as graph theory, knot theory, and non-Euclidean geometries

Obtained donations from local vendors so that this event was free for all participants

Managed the $2000 budget for the event

Professional Development

o *Lumen Circles Success Accelerator* (6-week community of practice): Spring 2021

o *Supporting Your Students* Workshop, Nikki Jones & Anna Lee Walker, CMU: October 2020

o *Open Educational Resources*, Dustin Fife, State of Colorado's OER Council: October 2020

o Distance Education Summer Webinar Series (14 sessions), Summer 2020

o *Online Teaching Essentials* Course, Summer 2020

o Innovative Course Design Webinar Series, MAA: Summer 2020

   An Introduction to Online Inquiry-Based Learning

   Teaching Online Upper-Level Math Courses

   Build a Syllabus: An Introduction to Mastery Grading

o *Baking Quality into your Online Course: A recipe for online course design*, Abbe Herzig, AMS: Summer 2020

o *Formative Assessment in Mathematics in Remote Settings Panel Session*, AMS: Summer 2020

o *Outreach for Outcomes Faculty Collaboration* Webinar, April 2020

o *Visual Complex Analysis- GeoGebra Tools and Mapping Diagrams*, Martin Flashman, AMS-MAA Joint Mathematics Meetings: January 2020

o Faculty Development Presentations, CMU: Fall 2019

   o *Inclusion and Engagement*, Sam Dieguez (et.al.)

   o *Information Literacy*, Anne Bledsoe (et.al.)

o *Tactile Learning*, Lisa Driskell, CMU: Fall 2019

o CRM Advise Software Training, Jeremy Brown, CMU: Spring 2019

o Essential Learning Assessment Training, Brad Mello, CMU: Spring 2019

o *Math Circles* Minicourse, Janie Long, AMS-MAA Joint Mathematics Meetings, Baltimore: January 2019

o *Innovative Leadership* Workshop, Elizabeth Long Lingo, CMU: January 2018

o *Grant Proposal Writing* Workshop, CMU Office of Sponsored Programs: January 9-11, 2018

o *Developing Your Leadership Groove*, CMU: Fall 2017

o *Academic Research Dollars: Supporting the Teacher-Scholar Model*, CMU: Fall 2017

o *Active Learning Bootcamp* Workshop, RaKissa Manzanares/Gary Olson, MAA RMS Meeting: April 2017

o *Innovations in Higher Education, Recent Trends in Accreditation: The Faculty*, Jeff Rosen, The Higher Learning Commission: January 2016

o *Modeling Across the Mathematics Curriculum*; MAA Section Meeting, Colorado Springs, CO: April 2015

o Project NExT Fellow (1997 Peach Dot)

> Project NExT is an MAA program comprised of recent Ph.D.'s in the mathematical sciences with the common goal of improving the teaching and learning of undergraduate mathematics.

> Continued participation in teaching enhancement sessions, workshops and list-serve discussions organized by NExT Fellows.

o SIMIODE Workshop Development (2018, 2019)

> Co-created a faculty development program for use by universities that were host schools for SCUDEM, an international mathematics modeling competition (over 40 sites).

o KAFM radio show "Reader's Radio": invited as guest expert for show on the Steven Strogatz book "Infinite Powers: How Calculus Reveals the Secrets of the Universe" (2019)

o Reviewer for several Calculus, Precalculus, and College Algebra texts, including Larson Calculus, 10th edition.

o Completed MOOCs at the Santa Fe Institute

> Introduction to Complexity Theory (2013)

> Introduction to Dynamical Systems and Chaos (2015)

o Invited participant: Cengage Learning's Enhanced Web Assign Summer Training Institute, Chicago IL (Summer 2014)

o Invited panel member for Alpha Chi Honor Society event on Online Teaching and Learning (Spring 2013)

o Invited participant: Pearson's MyMathLab Summit, San Diego CA (Fall 2013)

o Faculty consultant to the Educational Testing Service—AP Calculus Reader (1999, 2000)

o Graduate-Level Enrichment Courses, Benedictine University (1999)

> Introduction to Computer Science

> Data Structures & Algorithm

Recent Service (Selected)

Professional Service……………………………………………………………………………………….

- o MAA Tensor Women and Mathematics Grant Review Panel (2021)
- o Rocky Mountain Section Congressional Representative to the Mathematical Association of America (MAA) (June 2020-present)
- o Chair/Organizer: MAA Rocky Mountain Section Online Conference (April 2021)
- o Executive Committee: Rocky Mountain Section-MAA (June 2020-present; 2015-16)
- o RMS-MAA committee to organize and run student mathematics competition at regional conference (2017-2018)
- o MAA Rocky Mountain Section Early Career Teaching Award Selection Committee (2017)
- o Chair/Organizer: Joint Rocky Mountain-Intermountain MAA Conference (April 2016)
- o RMS-MAA Nominating Committee (2003-06; Chair: 2004-05)

University Service……………………………………………………………………………………

- o Faculty Success Committee (Fall 2021)
- o Essential Learning Assessment Working Group (2020-21)
- o Student Orientation Advisor (ongoing as needed)
- o Academic Policies Committee (2017-20; 2006-08; Chair: 2006-08)
- o Teacher to Teacher Professional Development Planning Committee (2011-20; Chair: 2018-20)
- o Ad-Hoc Committee on Developmental and Essential Learning Mathematics (2017-18)
- o Who's Who Selection Committee (2013-2017)
- o Higher Learning Commission Accreditation Committee (Integrity Subcommittee) (2011-2013)
- o Chair, Committee to Study Faculty Overloads (Spring 2013)
- o Faculty Senator (2008-12; Vice-President: 2011-12)
- o Quality Matters Committee for Online and Distance Instruction, Fall 2011 – Spring 2012
- o Learning Management System Selection Committee, Fall 2010-Spring 2011

Departmental Service……………………………………………………………………………………

- o Coordination of 10-14 sections per semester of Essential Learning Mathematics course for non- STEM major (Fall 2020-present)
- o Mathematics Program Working Group (2015-present)
- o Mathematics Pre-tenure Committee (2009-present)
- o Academic Advisor for Mathematics Majors and Minors (ongoing)
- o Tenure-Track and Instructor Search Committees for Math, Applied Math, and Statistics positions
- o Textbook Selection Committees (often serving as Chair) for a wide range of classes such as Introduction to Proofs, Calculus, College Algebra, and Mathematical Investigations
- o Mathematics Program Review Committee (2014-15; 2003-2004; Chair: 2003-04)

- o *Math Extravaganza!* Faculty Coordinator (2005-11)
- o Math Club Advisor (2005-2012)

Community Service…………………………………………………………………………………………….

- o Elementary School Mathematics Presentations: Gave three mathematics presentations at Wingate Elementary School (two to 5th graders and one to the Gifted and Talented 4th grade class)
- o Science Fair Judge: Served as a judge for the science fair at Wingate Elementary School

Software Proficiency

- o Maple, Geogebra, LaTeX, Word, Excel, PowerPoint, MyMathLab, WebAssign, Lumen OHM

Professional Affiliations

- o Mathematical Association of America
- o Sigma Xi Scientific Research Society
- o Pi Mu Epsilon Mathematics Honor Society
- o Kappa Mu Epsilon Mathematics Honor Society

Dr. Philip E. Gustafson
Professor of Mathematics

Department of Computer Science, Mathematics and
Statistics Colorado Mesa University

Academic Degrees
- Ph.D.   Washington State University   1994   Mathematics
- M.S.   Washington State University   1990   Mathematics
- B.S.   State Univ. of New York, Oneonta   1988   Mathematics

Professional Experience

- 2007 – Present   Professor, Department of Computer Science, Mathematics and Statistics, Colorado Mesa University.
- Spring 2014   Sabbatical, Colorado Mesa University.
- Fall 2005   Sabbatical, Mesa State College, Fall Semester.
- 2001 – 2007   Associate Professor, Department of Computer Science, Mathematics and Statistics, Mesa State College.
- 1998-2001   Assistant Professor, Department of Computer Science, Mathematics and Statistics, Mesa State College.
- 1994-1998   Assistant Professor, Division of Mathematics and Computer Science, Emporia State University, Emporia, KS.
- 1988-1994   Graduate Teaching Assistant, Department of Pure and Applied Mathematics, Washington State University, Pullman, WA.
- 1987-1988   Calculus Lab Assistant, State University of New York, College at Oneonta.
- 1987-1988   Physics Lab Assistant, State University of New York, College at Oneonta.

Awards & Recognition
- Exemplary Faculty Award, Colorado Mesa University, May 2021, 2018, 2013, 2012, 2011, 2009.
- Nominated for CMU Distinguished Faculty Award, December 2015.
- The Outstanding Achievement in Scholarship Award, Mesa State College, May 2008.
- Dr. Martina Keck Wall of Fame Award, Academic Services, Mesa State College, 2005.
- Certificate of Merit, Academic Services, Mesa State College, 2004 - 2005.
- Project NExT Fellow (New Experiences in Teaching), Mathematical Association of America and the Exxon Education Foundation, 1995 - 1996.
- Excellence in Teaching Award, Campus-wide award for Graduate Teaching Assistants, Washington State University, 1993.
- Sidney G. Hacker Outstanding Graduate Student Award, Department of Pure and Applied Mathematics, Washington State University, 1993.
- Kappa Mu Epsilon, Kansas Beta Chapter, 1996
- Sigma Xi, Honorary Scientific Research Society, 1994.
- Outstanding Senior Math Award, Mathematics Department, SUNY Oneonta, 1988.
- Sigma Pi Sigma, Physics Honor Society, SUNY Oneonta, 1988.

Professional Membership

- Mathematical Association of America
- BIG SIGMAA
- Kappa Mu Epsilon
- Sigma Pi Sigma

Courses Taught

Colorado Mesa University, 1998 - Present	Emporia State University, 1994 - 1998
(1) MATH 110 College Mathematics	(1) MA098 Intermediate Algebra (3 credits) (Supervised Elem. Ed. student teachers)
(2) MATH 113 College Algebra	
(3) MATH 119 Precalculus	
(4) MATH 121 Business Calculus	(2) MA161 Calculus I & Calculus I Lab
(5) MATH 146 Calculus for Biology	(3) MA161Z Honors Calculus
(6) MATH 151 Calculus I	(4) MA225 Math as a Decision-Making Tool
(7) MATH 152 Calculus II	(5) MA240 Discrete Mathematics
(8) STAT 200 Probability and Statistics	(6) MA262 Calculus II & Calculus II Lab
(9) MATH 225 Computational Linear Algebra	(7) MA263 Calculus III
(10) MATH 236 Differential Eqns & Linear Algebra	(8) MA291 Mathematical Modeling
	(9) MA322 Introduction to Linear Algebra
(11) MATH 240 Introduction to Advanced Math	(10) MA735 Advanced Calculus I
(12) MATH 253 Calculus III	(11) MA736 Advanced Calculus II
(13) MATH 260 Differential Equations	(12) MA480 Interdisciplinary Science Studies
(14) MATH 325 Linear Algebra	
(15) MATH 360 Methods of Applied Mathematics	
(16) MATH 361 Numerical Analysis	
(17) MATH 362 Fourier Analysis	
(18) MATH 365 Mathematical Modeling	
(19) MATH 366 Methods of Applied Math II	
(20) MATH 369 Discrete Structures	
(21) MATH 394 Mathematics Colloquium	
(22) MATH 395 Independent Study	
(23) MATH 397 Structured Research	
(24) MATH 460 Linear Algebra II	
(25) MATH 452 Real Analysis I	
(26) MATH 466 Methods of Applied Math III	

Professional Development and Achievement in Teaching

Online Teaching Essentials Course, Fall 2016**.**

Development of a new course. As the outcome of two sabbaticals, I have developed and authored all course materials for MATH 362 *Fourier Analysis*, including textbook, lesson plans, homework problems, projects, MATLAB computer programs. Students receive exposure to topics central to audio and image technology, working with mathematics and hands-on applications. This is not a standard course offering in mathematics at most colleges, and therefore is a reflection of my interests in the subject area.

Participated in Elizabeth Long Lingo's workshop on Creativity and Passion, CMU, January 12, 2018.

Participated in Leslie Myers' workshop on Cognition and Learning, CMU, August 13, 2014.

Participated in MAA PREP (Professional Enhancement Programs) workshop, "Wavelets and Applications: A Multidisciplinary Undergraduate Course with an Emphasis on Scientific Computing," University of St. Thomas, St. Paul, MN, June 2006. Funded by NSF and MAA.

Conference Participation: I regularly participate in the Joint National AMS-MAA Meetings and regional MAA meetings, and I enjoy learning from new ideas presented at the teaching related talks.

Project NExT Fellow, 1995-1996 Inductee. Project NExT (New Experiences in Teaching), a national program funded by Exxon and the MAA.

Project NExT Consultant, 2007 – 2017. Nominated and selected to serve as a consultant and mentor the Mathematical Association of America's Project NExT (New Experiences in Teaching).

Publications

1. *Elementary Fourier Analysis with Audio and Image Processing*, 2nd Edition, Phil Gustafson, CreateSpace Publishing (Amazon.com), May 2018.
2. *Elementary Fourier Analysis with Audio and Image Processing*, Phil Gustafson, CreateSpace Publishing (Amazon.com), August 2017.
3. *In Memory of Carla D. Martin, BIG SIGMAA Officer & Mathematician,* Phil Gustafson, BIG SIGMAA Newsletter (Business, Industry and Government Special Interest Group of MAA), Vol. 11, No. 2, 2015.
4. *A Brief History of the BIG SIGMAA,* Phil Gustafson, The BIG SIGMAA Newsletter (Business, Industry and Government Special Interest Group of the MAA), Vol. 9, No. 2, 2013.
5. *BIG Mathematical Experiences at the JMM*, Phil Gustafson, Carla D. Martin, MAA Focus, Vol. 30, Number 2, February-March 2010.
6. *BIG Events at the JMM*, Phil Gustafson, MAA Focus, Vol. 29, Number 2, February-March 2009.
7. *Book Review: Discrete Fourier Analysis and Wavelets: Applications to Signal and Image Processing,* S. Broughton, K. Bryan (Wiley 2009), MAA Online Reviews, April 2009.
8. *Mathematics in Business, Industry and Government (BIG): Alive and Well, But Living Under Different Names* (*An overview of The SIAM Report on Mathematics in Industry*), Phil Gustafson, The BIG Notebook, Vol. 4, Number 1, August 2008.
9. *Mathematics Experiences in Business, Industry and Government*, Phil Gustafson, MAA Focus, Vol. 28, Number 3, March 2008.
10. *Orthogonal Rational Expansions of Functions using Laurent Gaussian Quadrature Rules with Numerical Examples*, Philip E. Gustafson, Communications in Analytic Theory Continued Fractions, Vol. 15, 2007.

11. *Mathematics Experiences in Business, Industry and Government*, Phil Gustafson, MAA Focus, Vol. 27, Number 3, March 2007.

12. *Mathematics Experiences in Business, Industry and Government*, Phil Gustafson, MAA Focus, Vol. 26, Number 3, March 2006.

13. *Mathematics Experiences in Business, Industry and Government*, Phil Gustafson, MAA Focus, Vol. 25, Number 3, March 2005.

14. *PowerPoint Supplements*, Elementary Differential Equations and Boundary Value Problems, Boyce and DiPrima, 8th Edition, Wiley, 2004.

15. *Mathematics Experiences in Business, Industry and Government*, Phil Gustafson, MAA Focus, Vol. 24, Number 3, March 2004.

16. *How to Pack Lunch for a Mars Mission, and other BIG Math Projects*, Phil Gustafson, MAA Focus, Vol. 23, No. 5, May/June 2003.

17. *A Marriage of Sciences: The Value of Interdisciplinary Research in Undergraduate Education*, David K. Saunders, Ronald Keith, Elizabeth G. Yanik, Phil Gustafson, Journal of College Science Teaching, Vol. 32, No. 6, March/April 2003.

18. *Gaussian Quadrature Rules and Numerical Examples for Strong Extensions of Classical Mass Distributions,* Philip E. Gustafson, Brian A. Hagler, Journal of Computational and Applied Mathematics, Volume 105, p. 317-326, 1999.

19. *The Strong Chebyshev Distribution and Orthogonal Laurent Polynomials,* S. Clement Cooper, Philip E. Gustafson, Journal of Approximation Theory, Vol. 92, No. 3, 1998.

20. *Interpolating Laurent Polynomials,* S. Clement Cooper, Philip E. Gustafson, Orthogonal Functions, Moment Theory, and Continued Fractions, Theory and Applications, (W. B. Jones, A. Sri Ranga, editors), Lecture Notes in Pure and Applied Mathematics/199, Marcel Dekker, 1998.

21. *The Changes of Russian Winter Snow Accumulation During 1936 - 1983 and its Spatial Patterns,* Hengchun Ye, Han-Ru Cho, Philip E. Gustafson, Journal of Climate, Vol. 11, 1998.

22. *A Wave Equation Model of Rattlesnake Rattle Motion,* Philip E. Gustafson, David K. Saunders, Proceedings of the Conference on Applied Mathematics, Univ. Central Oklahoma, 1998.

23. *Digital Image Processing as a Computing Tool in an Interdisciplinary Science Course,* Phil Gustafson, Ron Keith, David Saunders, Journal of Computing in Small Colleges, Vol. 13, No. 4, March 1998.

24. *Extremal Properties of Strong Quadrature Weights and Maximal Mass Results for Truncated Strong Moment Problems,* S. Clement Cooper, Philip E. Gustafson, Journal of Computational and Applied Mathematics, Vol. 80, 1997.

25. *Digital Image Processing in Mathematical Modeling and Interdisciplinary Science,* Phil Gustafson, Ron Keith, David Saunders, Proceedings, Ninth Annual International Conference on Technology in Collegiate Mathematics, Reno, Nevada, November 1996.

26. *Experiences with Calculus Computer Laboratory Projects,* Philip E. Gustafson, Journal of Computing in Small Colleges, Vol. 12, No. 1, September 1996.

27. *An Electronic Calculus Bulletin Board,* Joe Yanik, Betsy Yanik, Phil Gustafson, Proceedings, Eighth Annual International Conference on Technology in Collegiate Mathematics, Houston, TX, Nov. 1995.

28. *Spectral Analysis of the Strong Tchebycheff Distribution,* S. Clement Cooper, Philip E. Gustafson, Proceedings of the Eleventh Annual Conference on Applied Mathematics, University of Central Oklahoma, Edmond, OK, February 1995.

29. *Minimal Solutions of Three-Term Recurrence Relations and the Generation of Nonclassical Orthogonal Polynomial Sequences,* Philip E. Gustafson, Communications in the Analytic Theory of Continued Fractions, Vol. 1, 1992, pp. 21-31.

Abstracts
1. *Student Projects using Microphones and the FFT*, Phil Gustafson, Abstracts of Papers Presented to the American Mathematical Society, Vol. 34, No. 1, 2013.
2. *Student Voice Waves: Investigations using Calculus and Freeware*, Phil Gustafson, Abstracts of Papers Presented to the American Mathematical Society, Vol. 33, No. 1, 2012.
3. *What Does That Picture Sound Like? Calculus and Photosounder*, Phil Gustafson, Abstracts of Papers Presented to the American Mathematical Society, Vol. 32, No. 1, 2011.
4. *Portable Haar Wavelet Projects with MATLAB,* Phil Gustafson, Abstracts of Papers Presented to the American Mathematical Society, Vol. 31, No. 1, Issue 159, 2010.
5. *Using Blue Man Group and Sound Waves to Introduce Fourier Analysis in Calculus,* Phil Gustafson, Abstracts of Papers Presented to the American Mathematical Society, Vol. 29, No. 1, Issue 151, 2008.
6. *Fourier Analysis in a Calculus Course Using Student-Generated Sound Waves,* Philip E. Gustafson, Abstracts of Papers Presented to the American Mathematical Society, Vol. 29, No. 1, 2007.
7. *A Maple Simulation for the 2004 Red Sox-Yankees Playoff Series,* Philip E. Gustafson, Abstracts of Papers Presented to the American Mathematical Society, Vol. 28, No. 1, 2006.
8. *PowerPoint as a Presentation Tool in a Differential Equations Course,* Philip E. Gustafson, Abstracts of Papers Presented to the American Mathematical Society, Vol. 27, No. 1, 2005.
9. *Calculus and Blood Hematocrit,* Philip E. Gustafson, Abstracts of Papers Presented to the American Mathematical Society, Vol. 20, No. 1, 1999.
10. *Calculus Reading Quizzes: Getting Students to Read the Text,* Philip E. Gustafson, Abstracts of Papers Presented to the American Mathematical Society, Vol. 17, No. 1, 1996.

Presentations
1. *Using RStudio in a Numerical Analysis Course,* Phil Gustafson, Rocky Mountain MAA Section Conference, Virtual Conference hosted by Metro State College, Denver, CO, April 2021.
2. *Enriching a Numerical Analysis Course with Historical Connections,* Phil Gustafson, Rocky Mountain MAA Section Conference, Fort Lewis College, Durango, CO, April 6, 2019.
3. *Fourier Analysis: Capturing Student Interest with Sound Waves*, Phil Gustafson, Rocky Mountain MAA Section Conference, University of Northern Colorado, Fort Collings, April 2018.
4. *Navier-Stokes Equations: Fluid Flow and Turbulence,* Invited Presentation, Fall 2017 Mathematics Colloquium, November 10, 2017.
5. *Computing with Formulas: What Could Go Wrong?* Invited Presentation, Physics Seminar, April 2017.
6. *Sound Waves and Calculus,* MATH 196 Mathematics Seminar, February 3, 2017.
7. *Sound Waves and Calculus,* MATH 196 Mathematics Seminar, October 20, 2016.
8. *Career Planning for Math Majors,* MATH 196 Mathematics Seminar, Sept. 15, 2016.
9. *Pi Day of the Century Celebration,* Contributing Speaker, CSMS Math Colloquium, March 13, 2015.
10. *Sound Waves, JPEG Compression, and MRI Imaging: Capturing Phenomena using Mathematics*, CMU Faculty Colloquium, Colorado Mesa University, February 2015.
11. *Sabbatical Report: Image and Audio Analysis,* CMU Board of Trustees meeting, December 3, 2014.
12. *Modeling Sound Waves using Trigonometry, Calculus and Linear Algebra,* CSMS Mathematics Colloquium, September 19, 2014.
13. *Magnetic Resonance Imaging (MRI): Fourier Analysis and Sound Waves,* CSMS Mathematics Colloquium, September 27, 2013.
14. *Student Projects using Microphones and the FFT*, Phil Gustafson, AMS-MAA Meetings, San

Diego, January 2013.

15. *Fourier Analysis: Calculus, Sound Waves and Frequencies,* Invited presentation, CMU Physics Colloquium, March 7, 2013.

16. *Sound Wave Analysis using Calculus, Linear Algebra, and MATLAB,* CSMS Mathematics Colloquium, March 8, 2013.

17. *Magnetic Resonance Imaging (MRI): Fourier Analysis and Sound Waves,* CSMS Mathematics Colloquium, September 27, 2013.

18. *Student Voice Waves: Investigations using Calculus and Freeware*, Phil Gustafson, AMS-MAA Meetings, Boston, January 2012.

19. *Return of the Yeti*, Mathematics Colloquium, Department of Mathematics, Computer Science and Statistics, Colorado Mesa University, November 2011.

20. *What Does That Picture Sound Like? Calculus and Photosounder*, Phil Gustafson, AMS-MAA Meetings, New Orleans, January 2011.

21. *Spectral Analysis: Math and Music*, Faculty Colloquium, Mesa State College, November 2010.

22. *Fan-fare for Fourier: Open Mic Analysis of Sound Waves*, Mathematics Colloquium, Department of Mathematics, Computer Science and Statistics, Mesa State College, February 2010.

23. *Calculus and the Spectral Analysis of Music*, Keynote Address (<u>invited</u>), Pikes Peak Undergraduate Research in Mathematics Conference, University of Colorado, Pueblo, February 2010.

24. *Spectral Analysis: Math and Music*, Keynote Presentation (<u>invited</u>), 12th Annual Math Extravaganza, Mesa State College, February 2010.

25. *Portable Haar Wavelet Projects with MATLAB,* Philip E. Gustafson, AMS-MAA Meetings, San Francisco, CA, January 2010.

26. *Calculus and the Spectral Analysis of Music*, Mathematics Colloquium, Department of Mathematics, Computer Science and Statistics, Mesa State College, September 2009.

27. *Using Blue Man Group and Sound Waves to Introduce Fourier Analysis in Calculus,* Philip E. Gustafson, AMS-MAA Meetings, San Diego, CA, January 2008.

28. *A Simulation Model of the Colorado Rockies in the 2007 Post Season*, Mathematics Colloquium, Department of Mathematics, Computer Science and Statistics, Mesa State College, Nov. 2007.

29. *Joseph Fourier and the Blue Man Group*, Mathematics Colloquium, Department of Mathematics, Computer Science and Statistics, Mesa State College, September 2007.

30. *Fourier Analysis in a Calculus Course Using Student-Generated Sound Waves,* Philip E. Gustafson, AMS-MAA Meetings, New Orleans, LA, January 2007.

31. *Fourier Analysis: Image and Audio Compression with Live Demonstrations,* Physics Colloquium, Mesa State College, October 2006.

32. *A Survey of Fourier Analysis: From Image Compression to Sunspots, Earthquakes and Irrational Numbers*, Mathematics Colloquium, Department of Mathematics, Computer Science and Statistics, Mesa State College, September 2006.

33. *Number Noise: What Do Irrational Numbers Sound Like, and Can Their Fourier Transforms Tell Us Anything?,* Philip E. Gustafson, Joint MAA Rocky Mountain and Intermountain Section Meetings, Grand Junction, CO, April 2006.

34. *Image & Audio Compression Using Fourier Analysis*, Mathematics Colloquium, Department of Mathematics, Computer Science and Statistics, Mesa State College, February 2006.

35. *A Maple Simulation for the 2004 Red Sox-Yankees Playoff Series,* Philip E. Gustafson, AMS-MAA Meetings, San Antonio, TX, January 2006.

36. *Monte Carlo Simulation: Leaving Modeling to Chance*, Mathematics Colloquium, Department of Mathematics, Computer Science and Statistics, Mesa State College, September 2005.

37. *PowerPoint as a Presentation Tool in a Differential Equations Course,* Philip E. Gustafson,

AMS- MAA Meetings, Atlanta, GA, January 2005.

38. *Math vs. Movie Monsters*, Mathematics Colloquium, Department of Mathematics, Computer Science and Statistics, Mesa State College, September 2004.
39. *Bar Codes Decoded*, Mathematics Colloquium, Department of Mathematics, Computer Science and Statistics, Mesa State College, January 2002.
40. *How to Be a Great Math Student,* Cathy Bonan-Hamada, Phil Gustafson, CSEMS seminar, Department of Mathematics, Computer Science & Statistics, Mesa State College, October 2001.
41. *Fair Division,* Phil Gustafson, Mathematics Colloquium, Department of Mathematics, Computer Science and Statistics, Mesa State College, October 2001.
42. *Area Under the Curve and Approximation Theory,* Mathematics Colloquium, Department of Mathematics, Computer Science and Statistics, Mesa State College, September 1999.
43. *Orthogonal Rational Expansions of Functions using Laurent Gaussian Quadrature Rules with Numerical Examples,* Philip E. Gustafson, International Conference on Rational Approximation, University of Antwerp, Belgium, June 1999.
44. *Wavelets 101: Basics of Wavelet Construction and Image Compression,* Invited seminar presentation, Department of Physics, Mesa State College, February 4, 1999.
45. *Calculus and Blood Hematocrit,* Phil Gustafson, AMS-MAA Meetings, San Antonio, TX, 1999.
46. *Wavelets 101: Basics of Wavelet Construction and Image Compression,* Mathematics Colloquium, CSMS Department, Mesa State College, November 1998.
47. *A Wave Equation Model of Rattlesnake Rattle Motion,* Philip E. Gustafson, Invited Seminar Presentation, Tabor College, Hillsboro, KS, April 1998.
48. *A Wave Equation Model of Rattlesnake Rattle Motion,* Philip E. Gustafson, Conference on Applied Mathematics, University of Central Oklahoma, February 1998.
49. *Modeling the Rattle Motion of a Rattlesnake: A Project Involving Applied Analysis and Biology,* Philip
E. Gustafson, Joint Meetings Winter Meetings of the American Mathematical Association - Mathematical Association of America, Baltimore, MD, January 1998.

50. *An Interdisciplinary Scientific Modeling Course Integrating Biology, Mathematics, and Physics,* Phil Gustafson, Ron Keith, David Saunders, SMARTT Conference, Wichita, KS, Nov. 1997.
51. *Gaussian Quadrature Rules and Numerical Examples for Strong Extensions of Classical Mass Distributions,* Philip E. Gustafson, International Conference on Continued Fractions and Geometric Function Theory, Trondheim, Norway, June 1997.
52. *A Better Way to Integrate? Strong vs. Gaussian Quadrature Rules with Numerical Results,* Seminar Presentation, Phil Gustafson, Division of Mathematics and Computer Science, ESU, April 1997.
53. *Basics of Wavelet Construction and Image Compression,* Invited Seminar Presentation, Ottawa University, Ottawa, KS, April 1997.
54. *Digital Image Processing in Mathematical Modeling and Interdisciplinary Science,* Phil Gustafson (Principal Speaker), Ron Keith, David Saunders, Ninth Annual International Conference on Technology in Collegiate Mathematics, Reno, Nevada, November 1996.
55. *Extremal Properties of Strong Quadrature Weights and Maximal Mass Results for Truncated Strong Moment Problems,* Philip E. Gustafson, International Conference and Workshop on Orthogonal Functions, Pade Approximants and Applications, Campinas, Sao Paulo, Brazil, June 1996.
56. *Experiences with Calculus Computer Laboratory Projects,* Philip E. Gustafson, 2nd Annual Consortium for Computing in Small Colleges, Central Plains Conf., St. Joseph, MO., April 1996.
57. *A Case Study of Interdisciplinary Collaboration,* Ron Keith, Phil Gustafson, David Saunders,

Brown Bag Luncheon, Teaching Enhancement Center, ESU, November 1996.

58. *Design and Implementation of an Undergraduate Interdisciplinary Research Experience,* Phil Gustafson, Ron Keith, David Saunders, Mathematics in Undergraduate Life Sciences Conference (NSF Funded), Iowa State University, Ames, Iowa, May 1996.
59. *How Wavelets are Constructed,* <u>Invited Seminar Presentation</u>, Pittsburg State University, Department of Mathematics, April 1996.
60. *Basics of Wavelet Construction and Image Compression,* <u>Invited Seminar Presentation</u>, University of Kansas, Department of Mathematics, April 1996.
61. *A Reflection on the Project NExT Experience,* MAA Kansas Section and Kansas Mathematics Association of Two-Year Colleges, McPherson College, KS, April 1996.
62. *Calculus Reading Quizzes: Getting Students to Read the Text,* AMS-MAA meetings, January 1996.
63. *An Electronic Calculus Bulletin Board,* Joe Yanik, Betsy Yanik, Phil Gustafson, Eighth Annual International Conference on Technology in Collegiate Mathematics, Houston, TX, November 1995.
64. *Computers in Calculus,* Poster exhibit, Emporia State University Faculty Research Forum and University Honors Assembly, Joe Yanik, Betsy Yanik and Phil Gustafson, May 1995
65. *MATLAB Tutorial,* Seminar Presentation, Phil Gustafson, Emporia State University, Division of Mathematics and Computer Science, ESU, September 1995.
66. *Wavelets 101,* Seminar Presentation, Division of Math and CS, Emporia State University, March 1995.
67. *Spectral Analysis of the Strong Tchebycheff Distribution,* Eleventh Annual Conference on Applied Mathematics, University of Central Oklahoma, Edmond, OK, February 1995.
68. *The Strong Tchebycheff Distribution and Orthogonal Laurent Polynomials,* Continued Fractions Mini- Conference, University of Colorado, Boulder, May 1994.
69. *Determinacy of Strong Moment Functionals with Bounded True Interval of Orthogonality,* International Symposium on Nonlinear Numerical Methods and Rational Approx, Antwerp, Belgium, Sept. 1993.
70. *Three-Term Recurrence Relations and Closed Form Expressions for the Chebyshev Orthogonal L- Polynomials,* Continued Fractions Mini-Conference, University of Colorado, Boulder, 1993.
71. *Generating Nonclassical Orthogonal Polynomial Sequences,* Continued Fraction Mini-Conference, University of Colorado, Boulder, June 1991.

Collaborative Student Scholarship Presentations
1. *Modeling SARS CoV-2 with Differential Equations,* Evan Lavin, Simone Babet, Phil Gustafson, Poster Presentation, Student Showcase, Colorado Mesa University, April 2021.
2. *A Simulation of Menu Orders for a Local Restaurant,* Eva Cruz, Phil Gustafson, Paper and Poster Presentation, Mathematics Colloquium, CMU, December 2020.
3. *Modeling Energy Expenditure for Hunting on Elk Mountain, Colorado,* Lew Griffiths, Phil Gustafson, Poster Presentation, Virtual Student Showcase, CMU, April 2020.
4. *Modeling Energy Expenditure for Hunting on Elk Mountain, Colorado,* Lew Griffiths, Phil Gustafson, Paper and Poster Presentation, Mathematics Colloquium, CMU, December 2019.
5. *Linear Programming: Finding Optimal Solutions to the Backpack Problem,* Jessica Sheldon, Phil Gustafson, Paper Presentation, Mathematics Colloquium, CMU, May 2017.
6. *Linear Programming: Finding Optimal Solutions to the Backpack Problem,* Jessica Sheldon, Phil Gustafson, Poster Presentation, Student Showcase, Colorado Mesa University, April 2017.
7. *The Mathematics Behind the Digital Image,* Amanda O'Connor, Phil Gustafson, Paper Presentation, Senior Seminar Presentation, Mathematics Colloquium, CMU, May 2015.
8. *The Mathematics Behind the Digital Image,* Amanda O'Connor, Phil Gustafson, Poster Presentation, Student Showcase, Colorado Mesa University, April 2015.

9. *Holograms and Fourier Analysis,* Clint Anderson, Phil Gustafson, Senior Seminar Presentation, Mathematics Colloquium, Colorado Mesa University, April 2012.
10. *Holograms and Fourier Analysis,* Clint Anderson, Phil Gustafson, Student Scholar's Symposium, Colorado Mesa University, April 2012.
11. *MP3 Compression,* Gordon Gibson, Phil Gustafson, Senior Seminar Presentation, Mathematics Colloquium, Colorado Mesa University, April 2011.
12. *MP3 Compression,* Gordon Gibson, Phil Gustafson, Student Scholar's Symposium, Colorado Mesa University, April 2011.
13. *Mathematics of JPEG Compression,* Heidi Chynoweth, Phil Gustafson, Senior Seminar Presentation, Mathematics Colloquium, Mesa State College, April 2010.
14. *A Study of the Mathematics Behind JPEG Compression,* Heidi Chynoweth, Phil Gustafson, Student Scholar's Symposium, Mesa State College, April 2010.
15. *Wavelets and Image Compression,* Heather Thomas, Phil Gustafson, Senior Seminar Presentation, Mathematics Colloquium, Mesa State College, May 2008.
16. *Wavelets and Image Compression,* Heather Thomas, Phil Gustafson, Student Scholar's Symposium, Mesa State College, April 2008.
17. *Computational Fluid Dynamics,* Matthew Seymour, Phil Gustafson, Senior Seminar Presentation, Mathematics Colloquium, Mesa State College, May 2007.
18. *Modeling Los Angeles Smog,* Benjamin Blehm, Phil Gustafson, Senior Seminar Presentation, Mathematics Colloquium, Mesa State College, December 2005.
19. *Mathematical Models in Aerodynamics,* Jake Lewis, Phil Gustafson, Senior Seminar Presentation, Mathematics Colloquium, Mesa State College, May 2005.
20. *Fundamental Mathematical Models in Aerodynamics,* Jake Lewis, Phil Gustafson, Poster Presentation, Student Scholar's Symposium, Mesa State College, April 2005.
21. *Haar Wavelets and the Orthogonal Decomposition Theorem,* Nathan Atkinson, Phil Gustafson, National Meetings of the AMS and MAA, University of Colorado, Boulder CO, August 2003.
22. *Haar Wavelets and the Orthogonal Decomposition Theorem,* Nathan Atkinson, Phil Gustafson, Regional Meeting of the MAA, Air Force Academy, April 2003.
23. *Haar Wavelets and the Orthogonal Decomposition Theorem,* Nathan Atkinson, Phil Gustafson, Student Scholar's Symposium, Mesa State College, April 2002.
24. *Exploration of Haar Wavelets with the TI-89 Calculator,* Nathan Atkinson, Phil Gustafson, Regional Meeting of the MAA, University of Wyoming, April 2002.
25. *Exploration of Haar Wavelets with the TI-89 Calculator,* Nathan Atkinson, Phil Gustafson, Student Scholar's Symposium, Mesa State College, April 2002.
26. *Fractals and the Chaotic Order of Nature,* Thela Morales, Phil Gustafson, Student Scholar's Symposium, Mesa State College, April 2002.
27. *How Much Can You Ljft?* Thela Morales, Jennifer Bennett, Murray Fisher, Wendy Serve, Phil Gustafson, Student Scholar's Symposium, Mesa State College, April 2001.
28. *Leaping (and Sprinting) Lizards,* Thela Morales, Phil Gustafson, Student Scholar's Symposium, Mesa State College, April 2001.
29. *Basics of Wavelets and Signal Compression,* Nathan Atkinson, Phil Gustafson, Student Scholar's Symposium, Mesa State College, April 2001.
30. *Interdisciplinary Studies in the Mathematical, Physical and Biological Sciences,* Poster exhibit, State Legislators Campus Visit, Emporia State University, Dave Saunders, Phil Gustafson, Ron Keith and undergraduates Muhammad Nashatizadeh, Mike Kralic, Wendy Helsel, Nov. 1997.
31. *Interdisciplinary Studies in the Mathematical, Physical and Biological Sciences,* Poster exhibit, Regents Campus Visit, Emporia State University, Dave Saunders, Phil Gustafson, Ron Keith and undergraduate Muhammad Nashatizadeh, Mike Kralic, Wendy Helsel, October 1997.
32. *Interdisciplinary Studies in the Mathematical, Physical and Biological Sciences: What the NBA*

would like to know, Poster, ESU Research and Creativity Forum, Dave Saunders, Phil Gustafson, Ron Keith and students M. Nashatizadeh, M. Kralic, W. Helsel, May 1997.

33. *Interdisciplinary Studies in the Mathematical, Physical and Biological Sciences,* Poster exhibit, Emporia State University, Research and Creativity Forum and Grant Workshops, Dave Saunders, Phil Gustafson, Ron Keith and undergraduate interdisciplinary studies students Olivia Fowler, Tim Richardson, and Becky Younger, May 1996.
34. *Catch the Wave*, Masters Degree Presentation (Haar Wavelets), Ray Cole, Phil Gustafson, Division of Mathematics and Computer Science, Emporia State University, May 1996.

Grant Proposals

1. *USDE No Child Left Behind / Colorado Commission on Higher Education: Aligning Practices and Standards,* August 2003 - May 2004. Principal Investigator. Proposal funded.
2. *Colorado Eisenhower Professional Development Proposal: FLAME -Fostering Liberal Arts Degree with Mathematics Emphasis Project,* June 2001 - September 2002, Cathy Barkley (PI), Lisa Friel, Phil Gustafson, Kim Schneider. Proposal funded.
3. *NSF Proposal: 2001 Mathematics Odyssey Conference,* September 2000, Cathy Bonan-Hamada, Phil Gustafson. Proposal not funded.
4. *NSF Proposal: An Undergraduate Integrative Interdisciplinary Modeling Practicum,* June 1997. Philip
   E. Gustafson, Principal Investigator. Ronald L. Keith, David K. Saunders, Coinvestigators. Not funded.

5. *NSF Proposal: An Undergraduate Interdisciplinary Collaborative Research - Based Course,* proposal to the National Science Foundation, June 1996. Philip E. Gustafson, Principal Investigator. Ronald L. Keith, David K. Saunders, Co-investigators. Proposal not funded.
6. *NSF Collaborative Research at Undergraduate Institutions preproposal 1995: Mathematical and Physical Modeling of Tail-Rattling in Various Species of Rattlesnakes.* Phil Gustafson, Dave Saunders, and Ron Keith. The entire NSF CRUI program ended up not being funded by NSF.
7. *Emporia State University Internal Funding 1995: Interdisciplinary Studies in the Sciences,* funded.
8. *CMU Professional Development Fund,* Fall 2012: Conference presentation travel, funded.
9. *CMU Professional Development Fund,* Fall 2011: Conference presentation travel, funded.
10. *MSC Professional Development Fund,* Fall 2010: Conference presentation travel, funded.
11. *MSC Professional Development Fund,* Fall 2009: Conference presentation travel, funded.
12. *MSC Professional Development Fund,* Fall 2008: Conference presentation travel, funded.
13. *MSC Professional Development Fund,* Fall 2003: Conference presentation travel, funded.
14. *MSC Professional Development Fund,* Fall 2002: Conference presentation travel, funded.
15. *MSC Academic Enrichment Fund,* Spring 2002: Seminar speaker travel support, funded.
16. *MSC Professional Development Fund,* Fall 2001: Conference presentation travel, funded.
17. *MSC Academic Enrichment Fund,* Fall 2001: Student travel support, not funded.
18. *OSC Reallocation Funds, 2000:* Faculty Development summer stipend, funded.
19. *OSC Reallocation Funds, 1999:* Faculty Development summer stipend, funded.
20. *MSC Professional Development Fund, 1999:* Conference presentation travel, funded.
21. *Emporia State University Faculty Research and Creativity Committee, 1995: Mathematically Modeling the Rattle Motion of a Rattlesnake,* funded.

Other Scholarly Activity

Editor, *Communications in Analytic Theory of Continued Fractions,* 1998 - Present.

Session Co-Chair & Moderator, MAA Rocky Mountain Section Meeting, Colorado Mesa University, April 2016.

Session Co-Chair & Moderator, Joint MAA Rocky Mountain and Intermountain Section Meetings, Grand Junction, CO, April 2006.

Session Moderator, Joint MAA Rocky Mountain and Intermountain Section Meetings, Grand Junction, CO, April 2006.

Student Scholarship: Evan Lavin, Simone Babet (2021), Eva Cruz (2020), Lew Griffths (2019), Jessica Sheldon (2017), Amanda O'Conner (2015), Clint Anderson (2012), Gordon Gibson (2011), Heidi Chynoweth (2010), Heather Thomas (2008, 2009), Matthew Seymour (2007), Benjamin Blehm (2005), Jake Lewis (2004, 2005), Nathan Atkinson (2000 - 2003), Thela Morales (2001, 2002), Joe Moore (1998, 1999).

Referee: *Strong Stieltjes distributions and orthogonal Laurent polynomials with applications to quadratures and Padé approximations*, for Applied Mathematics Letters, January 2004.

Proceedings Organizer/Editor: Assembled/Edited proceedings for the conference *2001 Mathematics Odyssey,* Mesa State College, August 2001, Rocky Mountain Journal of Mathematics, June 2003.

Book manuscript review, *Discrete Fourier Analysis and Wavelets with Applications to Signal and Image Processing,* by Broughton and Bryan, Wiley, April 2009 (for MAA Reviews).

Invited book manuscript review, *Continued Fractions Volume 1: Convergence Theory,* 2nd Edition, Lorentzen and Waadeland, Atlantis Press/World Scientific, February 2008.

Invited book manuscript review, *Calculus,* by Briggs and Cochran, Pearson Publishing, October 2008.

Invited book manuscript review, *Mathematical Modeling with Excel,* Brian Albright, Jones and Bartlett Publishers, July 2008.

Invited book manuscript review, *Calculus,* by Briggs and Cochran, Pearson Publishing, October 2007.

Referee: *Proceedings of the International Conference on Orthogonal Functions, Moment Theory, Pade Approximants and Applications, Campinas, SP Brazil,* Lecture Notes in Pure and Applied Mathematics, Marcel Dekker, June 1997.

Referee, The Journal of Computing in Small Colleges, December 1995.

Directed Masters Degree Studies, 1995-1996, Division of Mathematics and Computer Science, Emporia State University. Supervised wavelets project for graduate student Ray Cole.

Moderator, Advanced Computer Science Session, Small College Computing Science Conference, Bolivar, MO, April 1995.

Judge, ACM International Collegiate Programming Contest, ESU, March 1995.

Participated in the minicourse *Research Experiences for Undergraduates,* at the Joint Meeting of the AMS and MAA, Cincinnati, OH, January 1994.

National Conference Participation: 20 years! Joint AMS-MAA Meetings, January 1994 - 2013.

Service

College and Community Service

Chair, Mathematics Faculty Search Committee, 2019 - 2020, applied mathematics assistant professor.

Faculty Coordinator, Graduate Certificate in Applied Math.

Admissions Chair, Graduate Certificate in Applied Math.

Faculty Lead, B.S. Mathematics Concentration in Applied Math.

Faculty Sponsor, Kappa Mu Epsilon (CMU Chapter), Fall 2001-Present.

Liaison Contact, Department Internships, CSMS Fall 2018 – Spring 2019; MS Fall 2019 - Present.

CMU Graduate Curriculum Committee, CSMS Representative, Fall 2018 -

Present. **CMU Tenure and Promotion Committee,** CSMS Representative, Fall

2011 – Fall 2016. **CMU Student Showcase Committee,** CSMS Representative,

Fall 2010 – Spring 2018.

Chair, CMU Distinguished Faculty Awards Committee, Fall 2015 – Spring 2018

CMU Distinguished Faculty Awards Committee, Fall 2011 – Spring 2018.

CMU Graduate Studies Advisory Committee, Fall 2016; Fall 2018 – Present.

Chair, Committee for Graduate Certificate in Applied Mathematics, CSMS Curriculum Development, Fall 2016.

Chair, Committee for Undergraduate Applied Math Concentration, CSMS Curriculum Development, Fall 2016.

CSMS Search Committee, 2014 - 2015, Mathematics tenure track position, CMU.

Higher Learning Commission (HLC) Committee: Teaching and Learning – Quality, Resources and Support, Fall 2015

CSMS Mathematics Program Working Group, 2014 - Present.

CSMS Pre-Tenure Committee, November 2015 - Present

Organizer, Retirement Banquet, January – May 2015, Phil Kavanagh

Panelist, New to CMU Teaching Effectiveness Panel, CMU, August 13,

2012. **CMU Career Fair**, Math Representative, October 2011

CSMS Search Committee, 2010 - 2011, Mathematics Education position, Mesa State College.

Chair, CSMS Course Development, MATH 135/136 Engineering Calculus I & II with program modifications, BS Mathematics, Mathematics Minor, Statistics Minor, Fall 2011.

Chair, Calculus Book Search Committee, Spring 2011.

Department Brochure Preparation, Spring 2009 – Fall

2013. **MAA Department Liaison,** Fall 2008 – Present.

CMU MavScholars Representative, CSMS, September 24, 2010.

Search Committee, 2009 - 2010, Mathematics position, Mesa State College.

Program Review Committee, Mathematics, Fall 2007 – Fall 2009.

Online Course Committee, Spring 2009.

Mesa Experience Representative, CSMS, April 2016, October 2009.

Chair, Mathematics Department Travel Committee, 2007 – 2008.

College Faculty Development Fund Committee, 2007 – 2008, Mesa State College.

Commencement Marshall, Mesa State College, May 2008.

College Honors and Recognition Committee, 2002 – 2006, Mesa State College. **Search Committee**, Spring 2006, Mathematics Education position, Mesa State College. **Chair, Math 240 Textbook Selection Committee**, Spring 2006.

Chair, Math 119 Textbook Selection Committee, Spring 2006.

Chair, Math 113 Textbook Selection Committee, Spring 2003 – 2007. **Chair, Math 110 Textbook Selection Committee**, Spring 2003 – 2007.

Curriculum Committee, 2002 - 2005, CSMS Department Representative, Mesa State College.

Teacher Education Advisory Council, Fall 03 – Fall 05

Chair and Author, Mathematics Minor Program Review, Spring 2004.

Chair, Curriculum Subcommittee Program Review: AA Early Childhood Education, 2004.

Putnam Team Organizer: Faculty initiator and sponsor for the 1999 William Lowell Putnam Mathematical Competition at Mesa State, and Faculty co-sponsor for the 2000-2004 competitions.

NCATE Review, 2004. Discussed accreditation issues with NCATE and CDE/CCHE representatives.

Chair, Curriculum Subcommittee Program Review: B.A. Psychology, Spring 2003.

Co-Author, Mathematics Program Review, Fall 2003, committee member and co-author.

Search Committee, Fall 2003, Mathematics Education position, Mesa State College.

Mathematics Department Alumni Liaison, Spring 2002-Present.

Science Fair Judge, Western Colorado Science Fair, Mesa State College, March 2002.

Search Committee, Fall 2001-January 2002, Mathematics position, Mesa State College.

3D Systems Tour Organizer: CSMS students and faculty, 3D Systems, Grand Junction, March 2002.

Search Committee, Spring 2001, Mathematics Education position, Mesa State College.

Computational Science Program Committee: 2000-2003, Mesa State College.

Conference Co-Organizer: *2001 Mathematics Odyssey Conference,* Mesa State College, August 2001. An international mathematics research conference on continued fractions and approximation theory.

Math 301 Committee Chair, Spring 2000: This committee was formed in response to new NCATE, NCTM, and state guidelines for the preparation of elementary teachers. As chair of this committee, I coordinated efforts to design a new course for the math component of new Liberal Arts Degree program.

Curriculum Committee - Program Review: Accounting, Spring 1999.

Community Service: Course Coordinator, Spirit of the Valley 5K, Fall 2013 – Fall 2017.

Community Service: Acolyte, St. Matthews Episcopal Church, January 2015 – May 2018.

Community Service: Referee, Linesman, and Assistant Soccer Coach, Grand Junction Fire FC Recreational Soccer League, Spring 2013 – Present (U5 – U9).

Community Service: Cub Scout (Wolf) Den Leader, Pack 344, Wingate Elementary School, September 2012 – May 2013.

Community Service: Initiated and organized alumni event for Western Slope Washington State University graduates. This "Dinner and a Hike" gathering took place in Grand Junction, July 2000.

National Service

Panel Session Co-Organizer and Co-Chair, *Regional Mathematics Experiences in Business, Industry and Government (BIG),* Joint Meetings of the Intermountain and Rocky Mountain MAA Sections, April 2016.

BIG SIGMAA Chair, 2009 - 2013: Nationally elected Chair of *Business, Industry and Government Special Interest Group* (BIG SIGMAA); founding member, 2001 - present.

Session Co-Organizer: *Mathematics Experiences in Business, Industry and Government,* MAA Contributed Paper Session, Joint AMS-MAA Meetings, San Diego, January 2013.

Reception Organizer: *BIG SIGMAA*, Joint AMS-MAA Meetings, San Diego, January 2013.

Session Co-Organizer: *Mathematics Experiences in Business, Industry and Government,* MAA Contributed Paper Session, Joint AMS-MAA Meetings, Boston, January 2012.

Reception Organizer: *BIG SIGMAA*, Joint AMS-MAA Meetings, Boston, January 2012.

Session Co-Organizer: *Mathematics Experiences in Business, Industry and Government,* MAA Contributed Paper Session, Joint AMS-MAA Meetings, New Orleans, January 2011.

Reception Organizer: *BIG SIGMAA*, Joint AMS-MAA Meetings, New Orleans, January 2011.

Session Chair and Organizer: *Mathematics Experiences In Business, Industry And Government,* MAA Contributed Paper Session, Joint AMS-MAA Meetings, San Francisco, January 2010.

Invited Speaker Organizer: *From Netflix to Gerrymanders: A Sample of BIG Applications of Mathematics*

(Barry Cipra), BIG SIGMAA Guest Lecturer, Joint AMS-MAA Meetings, San Francisco, January 2010.

BIG SIGMAA Vice Chair for Programs: Vice Chair for Programs, BIG SIGMAA), 2001 - 2009.

MAA Project NExT Consultant: I am a nominated, active consultant and mentor for the MAA Project NExT (New Experiences in Teaching), 2007 - present.

Session Chair and Organizer: *Mathematics Experiences in Business, Industry and Government,* MAA Contributed Paper Session, Joint AMS-MAA Meetings, Washington D.C., January 2009.

Invited Speaker Organizer: *Calculus in Orbit* (Dan Kalman), BIG SIGMAA Guest Lecturer, Joint AMS- MAA Meetings, Washington D.C., January 2009.

Session Chair and Organizer: *Mathematics Experiences in Business, Industry and Government,* MAA Contributed Paper Session, Joint AMS-MAA Meetings, San Diego, January 2008.

Invited Speaker Organizer: *From Flapping Birds to Space Telescopes: The Modern Science of Origami*

(Robert Lang), Joint AMS-MAA Meetings, San Diego, January 2008.

Session Chair and Organizer: *Mathematics Experiences in Business, Industry and Government,* MAA Contributed Paper Session, Joint AMS-MAA Meetings, New Orleans, January 2007.

National MAA Committee: Invited member of the MAA Program Committee for MathFest 2006.

Session Chair and Organizer: *Mathematics Experiences in Business, Industry and Government,* MAA Contributed Paper Session, Joint AMS-MAA Meetings, San Antonio, January 2006.

Session Chair and Organizer: *Mathematics Experiences in Business, Industry and Government,* MAA Contributed Paper Session, Joint AMS-MAA Meetings, Atlanta, January 2005.

Session Chair and Organizer: *Mathematics Experiences in Business, Industry and Government,* MAA Contributed Paper Session, Joint AMS-MAA Meetings, Phoenix, January 2004.

Session Chair and Organizer: *Mathematics Experiences in Business, Industry and Government,* MAA Contributed Paper Session, Joint AMS-MAA Meetings, Baltimore, January 2003.

Reception Organizer: Organized and arranged catering for *Welcome Reception for Mathematicians in Business, Industry and Government*, Joint AMS-MAA Meetings, Baltimore, January 2003.

National MAA Committee: Nominated, active participant on the MAA *Committee on Industrial and Governmental Mathematics*, 1999 - 2003.

Editor, *Concerns of Young Mathematicians Newsletter,* Young Mathematicians Network, April 2002.

Panel Session Organizer: *BIG Math: Projects in Business, Industry and Government,* Panel Discussion, MAA Business, Industry and Government Special Interest Group, Joint AMS-MAA Meetings, San Diego, January 2002.

Reception Organizer: Organized and arranged catering for *Welcome Reception for Mathematicians in Business, Industry and Government*, Joint AMS-MAA Meetings, San Diego, January 2002.

Panel Session Organizer: *Math in Industry,* Panel Discussion, Sponsored by the MAA Committee on Industrial, Business and Government Mathematicians, Joint AMS-MAA Meetings, New Orleans, January 2001.

Board Member: *Young Mathematicians Network,* a national organization of young mathematicians publishing the monthly electronic newsletter, "Concerns of Young Mathematicians, 1996 – 2003.

Panel Session Organizer: *Finding Your Second Job,* Panel Discussion, Co-sponsored by the MAA and Young Mathematicians Network, Joint AMS-MAA Meetings, Washington DC, January 2000.

Undergraduate Research Poster Session Judge: AMS-MAA Meetings, Washington DC, January 2000.

Panel Session Organizer: *Solving the Two Body Problem,* Panel Discussion, Young Mathematicians Network, Joint AMS-MAA Meetings, San Antonio, TX, January 1999.

Editor, *Concerns of Young Mathematicians Newsletter,* Young Mathematicians Network, 1998.

Workshop Co-Organizer and Moderator, *Innovations in Teaching Workshop*, MAA Regional Meetings, Kansas Section, Pittsburg State University, Pittsburg, KS, March 1997.

Panel Session Organizer: *Career Opportunities for Young Mathematicians,* Young Mathematicians Network, Joint Winter Meetings of the AMS-MAA, San Diego CA, January 1997.

Conference Co-Organizer, *Project NExT Sessions, Second Year Participants,* Joint Summer Meetings of the AMS-MAA, Seattle, August 1996.

Panel Session Co-Organizer, *Grant Proposal Writing Session and Panel Discussion,* Project NExT, Joint Winter Meetings of the AMS-MAA, Orlando, FL, January 1996.

International Service

Editor, *Communications in Analytic Theory of Continued Fractions,* 1998-Present.

Conference Co-Organizer: *2001 Mathematics Odyssey Conference,* Mesa State College, August 2001. An international mathematics research conference on Rational Approximation and the Analytic Theory of Continued Fractions.

Proceedings Organizer: Assembled proceedings for the conference *2001 Mathematics Odyssey,* Mesa State College, August 2001, published by the Rocky Mountain Journal of Mathematics, June 2003.

Heath Hillman

Start Year: 2016

Program:	**Department:**
Mathematics	Computer Science, Mathematics, and Statistics

Faculty Rank:

Instructor

Highest Degree

MS   Youngstown State University   Mathematics   2016

Education:

Master of Science - Youngstown State University Mathematics - 2016
Bachelor of Science - Colorado Mesa University - Mathematics – 2014

Teaching 2003-Present:

Courses Taught

2016 Fall – MATH 110 – College Mathematics
2016 Fall – MATH 113 – College Algebra 2016
Fall – MATH 119 – Precalculus

Evidence of Continuous Improvement

2016 August – "New to Colorado Mesa University"
2016 August – "Webassign Training"

2016 August – "Critical Thinking Unmasked with Dr. Linda Nilson"

Advising 2003-Present:

Department level

Although I do not officially have students to advise, I assist my students in course selections for their interest, career, and educational goals.

Honors and Awards 2003-Present:

Local

2016 - Outstanding Graduate - Youngstown State University, Youngstown Ohio

Max L. McFarland

Instructor of Mathematics

Education and Certifications:

M.E. - Engineering Management University of Colorado: Boulder, CO

B.S. - Environmental Restoration and Waste Management, Mesa State College: Grand Junction, CO

A.S. - Mechanical and Aerospace Engineering, Mesa State College: Grand

Junction, CO Certified Quality Engineer, ASQ #33850

Certified Quality Auditor, ASQ #13619

Certified Quality Systems Auditor, RAB #Q05705

NQA-1 Lead Auditor with Rust Geotech and WASTREN-Grand Junction

Teaching 2003-Present:

Courses Taught

Math 110 College Math, Math 113 College Algebra, Math 121 Calculus for Business, Math 130 Trigonometry, Math 141 Analytical Geometry, Stat 200 Probability and Statistics, Engr 125 Computer- Aided Design and Fabrication, Engr 140-First-Year Engineering Projects

Department

Served on Book committees for M113 and Stat 200, Served on hiring committee for Instructor of Mathematics position.

Community

Played with musical groups for various benefit events.

Professional Experience:

2005-Present Owner, Samurai, LLC, Grand Junction, CO

1998-2005 Quality Manager, 3D Systems, Grand Junction, CO

1996-1997 Quality Assurance Coordinator, WASTREN, Grand

Junction, CO 1992-1996 Quality Assurance Specialist, Rust Geotech,

Grand Junction, CO

Managed and coordinated the quality assurance and control systems at 3D Systems. Site Safety Officer at the Grand Junction facility. Supervised quality staff in day-to-day activities. Managed SIM production activities, document control, and facility maintenance personnel. Managed budgets for several departments.

Lead quality initiative to improve production and product performance using Six Sigma and Design of Experiments techniques to solve specific issues and/or optimize production and product characteristics. Conducted detailed analyses and reported results of production metrics, product performance in the field, and new product reliability to senior management.

Provided quality assurance consultation to environmental remediation projects with Rust Geotech and WASTREN-Grand Junction, both contractors for the Department of Energy. Quality Assurance Coordinator for the design and initial construction of the Monticello Repository. Wrote the Quality Assurance Plan for the construction of the Monticello Repository. Conducted and lead independent quality and environmental system audits of contractor and subcontractor activities in accordance with applicable requirement documents.

Performed work readiness reviews at key project stages. Conducted formal accident investigations. Reviewed and approved quality control plans, test procedures, sampling plans, and test results.

Prepared and lead training classes in SPC, Understanding Variation, Design of Experiments, and Safety. Developed data management and reporting system for quality issues. Performed internal and supplier quality audits. Monitored supplier performance and resolved quality issues as needed.

Education

Ph.D., Mathematics, Colorado State University, Summer 2014
- o Topic: Bridgeland Stability of Line Bundles on Surfaces
- o Advisor: Renzo Cavalieri

M.S., Mathematics, Colorado State University, Fall 2010

B.S., Mathematics, Colorado Mesa University (formerly Mesa State College), May 2008
- o Minor: Statistics
- o Summa Cum Laude

Academic Experience

Assistant Professor of Mathematics, Colorado Mesa University, 2015-present

Visiting Assistant Professor of Mathematics, University of Minnesota, Morris, 2014-2015

Graduate Teaching Assistant, Colorado State University, 2008-2014

Publications

E. Miles, J. Wellborn, "Evenness of Continuous Rhythm Patterns", The Pentagon, Volume 79, Number 2, Spring 2020, pp. 4-19

(submitted, Summer 2019 – awaiting review) "Approximating pi: an alternative first week in Calculus I" Journal of Inquiry Based Learning Modules

E. Miles, "Go Walk on a Hill: a 15-minute field trip for Calculus III" MAA Focus, Apr-May Issue, 2019

D. Arcara, E. Miles, "Projectivity of Bridgeland Moduli Spaces on Del Pezzo Surfaces of Picard Rank 2" International Mathematics Research Notices, Volume 2017, Issue 11, June 2017, pp. 3426–3462

R. Cavalieri, E. Miles, "Riemann Surfaces and Algebraic Geometry: A First Course in Hurwitz Theory" Cambridge University Press, September 2016 (Textbook, 194 pages)

D. Arcara, E. Miles, "Bridgeland Stability of Line Bundles on Surfaces." Journal of Pure and Applied Algebra 220 (2016), pp. 1655-1677

Talks Given

"How 'even' is that rhythm?" Regional MAA conference, online, Spring 2021

"Mathematizing Perspective: An Introduction to Projective Space" Math Colloquium, CMU, Fall 2019

"Go Walk on a Hill: a 15-minute field trip for Calculus III" Regional MAA conference, Fort Lewis College, Spring 2019

"Approximating pi as an introduction to limits in Calculus I" National MAA conference MathFest, Denver, Summer 2018

"Nice to meet you, elliptic curves!" Math Colloquium, CMU, Fall 2017

"Approximating pi as an introduction to limits in Calculus I" Regional MAA conference, CSU-Pueblo, Spring 2017

"Loops on Donuts: An Introduction to Topology" Mathematics Seminar, CMU, Fall 2016
"Nice Ellipses and Hyperbolas Give Projective Moduli Spaces" Regional MAA conference, CMU, Spring 2016
"Everything is broken, or: loops on donuts" Brown Bag Mathematics Colloquium, CMU, Spring 2016
"Mathematical Adventures" Brown Bag Mathematics Colloquium, CMU, Fall 2015
"From Derived Categories to Bridgeland Stability Conditions to Conic Sections" Mathematics Discipline Faculty Seminar, UMM, Fall 2014
"Projectivity of Bridgeland Moduli via Quivers on Del Pezzos" AMS Sectional Meeting, Special Session on Algebraic Geometry - Invited Speaker, San Francisco State University, Fall 2014
"Bridgeland Stability of Line Bundles on Smooth Projective Surfaces" Joint Mathematics Meetings, Baltimore, MD, Spring 2014
"Quivers, Line Bundles and Bridgeland Moduli" FRAGMENT (joint CSU-University of Colorado-University of Wyoming seminar), CSU, Spring 2013

Outreach

Math Extravaganza, Organizer, Fall 2016- Spring 2020
  o Annual event bringing 120-180 regional high school students to Colorado Mesa University for math and computer science activities, lunch and campus tours, and a keynote talk

Service

Mathematics Program Review, Cochair, Spring 2020-present
Library Advisory Committee, Chair Fall 2017-Spring 2021, member Fall 2016-Spring 2021
Textbook selection Committee - Math 119, Chair, Fall 2018
Math Program Working Group, Fall 2015-present
Essential Learning Committee, Spring 2019-present
Math Club Advisor, Fall 2016-Spring 2019
CMU Foundation Scholarship Selection Committee, Spring 2018
Hiring Committees
  o Visiting Assistant Professor of Mathematics, Chair, 2019
  o Assistant Professor of Mathematics, TT, 2 positions, 2017-2018
  o Instructor of Mathematics, 4 positions, 2017
  o Assistant Professor of Mathematics: Statistics, TT, 2016-2017
  o Instructor of Mathematics, 2016
Student Showcase Volunteer
  o Track facilitator, Spring 2016, 2018
  o Track judge, Spring 2017, 2019

Professional Development

CMU Professional Development Workshops, Fall and Spring, 2016-present
Attended Regional MAA conference, online, Spring 2021
Attended Regional MAA conference, Fort Lewis College, Spring 2019

Attended MathFest National MAA conference, Denver, Summer 2018
Attended Regional MAA conference, UNC Greeley, Spring 2018
Attended Regional MAA conference, CSU-Pueblo, Spring 2017
Attended Regional MAA conference, CMU, Spring 2016

Professional Memberships

Mathematical Association of America (MAA)

Holly Mitchell

hmitchell@coloradomesa.edu

Education

Texas Woman's University

MS in Mathematics   May 2017

BS in Mathematics (Minor in General Science)   August 2014

North Central Texas College

AA in General Studies   May 2010

Teaching Experience

Instructor of Mathematics and Statistics   August 2017 – Current

Colorado Mesa University   *Grand Junction, CO*

Taught and designed lesson plans for the following courses: *Probability & Statistics*, *Statistics for the Social and Behavioral Sciences*, *Mathematical Investigations*, *College Algebra*, and *Precalculus*.
Contributed to the development of *Mathematical Investigations*, a lower-level mathematics course that was redesigned to be a project-based course with an open-source textbook.
Emphasized real-world applications for research and statistics.
Evaluated student performance regularly with daily or weekly quizzes and promptly returned graded assignments to students.
Encouraged students' continued engagement in the classroom.
Improved techniques for managing students' differing levels of prior mathematical knowledge.
Used online learning management system, D2L, to communicate with students and provide access to supplemental content.
Worked with online homework software such as MyMathLab, Connect Math, and Lumen.

Graduate Teaching Assistant,

Statistics, Financial and Quantitative Literacy   August 2015 – May 2017

Texas Woman's University   *Denton, TX*

Designed lesson plans and taught *Elementary Statistics* course for first-year college students
Evaluated student performance regularly with daily quizzes to encourage students' continued

engagement
Promptly returned graded assignments to students
Worked with a diverse population of students, including many international students
Developed tactics for managing students' differing levels of prior mathematical knowledge
Received positive student evaluation score
Emphasized real-world applications for research and statistics
Managed disciplinary actions due to academic dishonesty
Used online learning management system, Blackboard, to communicate with students and provide access to supplemental content.
Worked with online homework software such as MyMathLab and WileyPLUS

Mathematics Tutor   August 2013 - August 2014

Texas Woman's University   *Denton, TX*

Tutored students in statistics, algebra, calculus, business analysis, trigonometry, matrix methods, and more
Prepared other tutors with training and material
Encouraged students to stay focused and engage with instructors in the classroom
Taught students study techniques and problem-solving skills

Research Experience

Master's Thesis

Prior Mathematical Knowledge as an indicator for Student Success in Elementary Statistics

Designed a mathematics pre-test to measure a student's prior mathematical knowledge
Found a significant association between pre-test scores and final course grade
Introduced an approach that allows instructors to establish intervention procedures to help at-risk students

Professional Experience

Graduate Assistant to the Associate Provost

Institutional Research and Data Management   August 2014 – May 2017

Texas Woman's University   *Denton, TX*

Assisted the department in statistical analysis pertaining to enrollment, retention rates, and graduation rates of the University.
Created and maintained initiation reports for the National Secretary of the national mathematics honor society, *Kappa Mu Epsilon*

Gained experience with SAS statistical software pertaining to reporting, ODS, style and formatting features.
Assisted in the process of generating teacher evaluations for every instructor at the university.
Worked with department to help file documents and format Budget Reports.

Service & Accomplishments

Officer of Kappa Mu Epsilon,

National Mathematics Honor Society   August 2013 - May 2014

Texas Woman's University   *Denton, TX*

Participated as a leader in monthly meetings to keep members informed and engaged.
Served as secretary of the organization, collecting student fees and managing funds.
Assisted in organizing fund-raisers and events to promote student participation.
Encouraged students with a passion for mathematics to join the organization.

Outstanding Graduate Student Award

Department of Mathematics and Computer Science   2015-2016 Recipient

Texas Woman's University   *Denton, TX*

Marcos A. Ortiz, PhD

(970) 248-1702   mortiz@coloradomesa.edu

Department of Mathematics and Statistics, 1110 North Avenue   Grand Junction, CO 81501

TEACHING EXPERIENCE

Colorado Mesa University	*2018-Present*

Instructor
- Courses Taught:
  - 100Level - College Algebra, Precalculus, Engineering Calculus I and II,

    Calculus I 200 Level - Calculus 3

Grinnell College	*2015-2018*

Visiting Assistant
Professor Courses
Taught:
- 100 Level - Functions and Differential Calculus, Functions and Integral Calculus,
  Calculus 2 200 Level - Linear Algebra, Elementary Number Theory
  300 Level - Topology, Abstract Algebra
  400 Level - Mentored Advance Project (See: Student Research)

Teaching Assistant
- Courses:
  - Mathematics for the Biological
    Sciences Calculus 1 and Calculus 2
    Calculus for the Biological Sciences
    Mathematics Research for
    Undergraduates

Camp Euclid
Research Mentor
- Academic year sessions: 2013, 2014
- Summer sessions: 2012, 2013, 2014, 2015

2012-

Graduate:

University of Iowa	*2009-*
PhD, Mathematics	*2015*

- Thesis: "Convex Decomposition Techniques Applied to Handlebodies"
- Thesis Advisor: Associate Professor Keiko Kawamuro

University of Iowa	*2012-*
Graduate Certificate in College Teaching	*2014*

Undergraduate:

University of Buffalo	*2005-*
BSc, Mathematics	*2009*

- Summa Cum Laude
- Honors Thesis Advisor: Professor William Menasco

Mathematical Sciences Research Institute   *2008*
MSRI-UP
  • Research Director: Professor Victor Moll
University of North Carolina at Wilmington   *2001-*
BA, Psychology   *2004*
TEACHING WORKSHOPS

AMS Project NExT   *2017-2018*

  • Project NExT Fellow- Blue '17 Cohort (Selective Teaching Workshop for Recent PhDs) MathFest
  2017 Workshops and Sessions: "Teaching Math to Future Teachers", "Interactive
  Teaching Methods","Fostering Engagement in Abstract Algebra", "Helping Students Learn to Write Proofs",
  "Rising to the Challenge of Diversifying the Mathematics Community", "Research Based Strategies for
  Reducing Stereotype Threat and Fostering Learning and Engagement in Math", "Teaching Real Analysis - An
  Active Approach"

AMS Joint Mathematics Meetings   *2016*

  • MAA Minicourse: "Directing Undergraduate Research" by A. Higgins
  • MAA Minicourse: "Increasing student engagement and understanding through active learning strategies in
    calculus"

AMS Joint Mathematics Meetings   *2011*

  • MAA Minicourse: "Getting students involved in undergraduate research" by A. Higgins and J. A. Gallian

STUDENT RESEARCH

  Grinnell College

Mentored Advance Project (Summer 2016)

  • Project Title: "Paths on Surfaces Induced by Contact Structures"
  • Undergraduate Student Researchers: Luc Janssen, Jimin Tan

RESEARCH

Research Interests:

  • Contact Topology
        Convex Decomposition Theory Classification of
        Tight Contact structures

  • Combinatorial Topology
  • Experimental Mathematics
  • Topological Data Analysis

Papers and Presentations:

  • Thesis Defense - "Convex Decomposition Techniqes Applied to Handlbodies" - U. Iowa, March 2015
    Committee: K. Kawamuro, B. Cooper, H. Fang, C. Frohman, M. Tomova
  • Invited Speaker - USTARS (2014) - "Using convex surfaces to find a bound on tight contact structures
    supported by thickened surfaces", UC Berkeley, Spring 2014

- Speaker - Graduate and Undergraduate Student Seminar (G.A.U.S.S.) - "Using convex surface theory to classify contact structures on some 3-manifolds", U. Iowa, Fall 2013
- Speaker - Graduate and Undergraduate Student Seminar (G.A.U.S.S.) - "An introduction to convex surface theory", U. Iowa, Spring 2013
- Invited Speaker - USTARS (2013) - "Results in Classifying Tight Contact Structures", Purdue University, Spring 2013
- Comprehensive Exam - "Results in the Classification of Contact Structures on 3-manifolds", U. Iowa, Fall 2012.
  Committee: K. Kawamuro, H. Fang, C. Frohman, D. Lafountain, M. Tomova

- Regular Speaker - Topology Seminar, U. Iowa 2013-2015
- Regular Speaker - Topology Reading Seminar, U. Iowa, 2011-2015
- Regular Speaker - Student Topology Seminar, U. Iowa, 2011-2015
- "Classification of Surfaces and Assigning Hyperbolic Metrics" - Undergraduate Honors Thesis, SUNY Buffalo 2009, Advisor: Dr. William Menasco
- "Exploring a Rational Landen Transformation of Degree Eight", Ricela Feliciano-Semidei, Marcos Ortiz, Jason Rosenberg, Kevin Wingfield. MSRI-UP 2008. Advisor: Dr. Victor Moll
  Poster presented at SACNAS 2008

  Poster presented at the Joint Meetings 2008

CONFERENCES

- MathFest 2017
- JMM 2008, 2010, 2011, 2012, 2013, 2014, 2016, 2018

- Texas Geometry and Topology Conference, UT Austin, 2011, 2014
- Combinatorial Link Homology Theories, Braids, and Contact Geometry, ICERM, 2014
- USTARS, UC Berkeley, 2014
  Invited Speaker - (see Papers and Presentations)

- Tech Topology Conference, GA Tech, 2011, 2012, 2013
- AMS Sectional Meeting, Washington University, 2013
- USTARS, Purdue 2013
  Invited Speaker - (see Papers/Presentations)

- Redbud Topology Conference, University of Arkansas, 2013
- Topology Students Workshop, UGA, 2012
- SACNAS 2008
  Poster Presentation - (see Papers and Presentations)

- Joint Mathematics Meetings 2008
  Poster Presentation - (see Papers and Presentations)

SERVICE

Grinnell College   *2015-2018*
- Mathematical and Statistical Sciences Student Seminar Organizer (2017-2018)
- Faculty and Staff Wellness Committee Member (2016-2017)
- Grinnell Science Project in Mathematics Mentor (2015)

The National Alliance for Doctoral Studies in the Mathematical Sciences	*2017-Present*
• Faculty Mentor to Pre-doctoral Students (2017-Present)	
Association for Women in Mathematics •	*2017-Present*
Volunteer - AWM Essay Contest Judge	
(2010)	
University of Iowa	*2010-2013*

- Chair of Graduate and Undergraduate Student Seminar Organization Committee (2013)
- Chair of Graduate Student Topology Seminar Organization Committee (2012, 2013)
- Member of Sonya Kovalevsky Day Organization Committee (Recruitment and Outreach 2011, 2012)
- Member of Sonya Kovalevsky Day Organization Committee (Fund-raising 2010)

AWARDS/FELLOWSHIPS

- University of Iowa Deans Fellowship, 2009-2014
- Alliance for Graduate Education and the Professoriate Fellowship, 2009-2014
- Hazel and John Wilson Scholarship for Outstanding Math Majors, SUNY Buffalo, 2007-2008
- Winning team, Buffalo Mathematical Modeling Competition for Graduate Students, 2008

PROFESSIONAL MEMBERSHIPS

- AWM - Association for Women in Mathematics
- MAA - Mathematical Association of America
- SACNAS - Society for the Advancement of Chicanos and Native Americans in the Sciences.

Last updated: September 30, 2021

Curriculum Vitae

RICHARD CHARLES OTT

Mathematics & Statistics
Colorado Mesa University
1100 North Avenue Grand
Junction, CO 81501
(970) 248-1725
rott@coloradomesa.edu

CURRENT EMPLOYER
COLORADO MESA UNIVERSITY (formerly Mesa State College), Grand

Junction, CO Associate Professor of Statistics, 8/06-present

Undergraduate Courses taught: Probability and Statistics, Statistical Methods, Mathematical Statistics I & II, Sampling Techniques, Design of Experiments, Topics in Biostatistics, College Algebra, Mathematics Colloquium, Statistics for the Social and Behavioral Sciences, Correlation and Regression, Statistics & Quality Control for Engineering

Technology incorporated: R, SPSS, Excel, PowerPoint, Word, MyStatLab, Graphing Calculators

Education

Ph.D. Rice University   2005, Houston TX
         Statistics
         Thesis: "On the Operating Characteristics of Some Non-parametric Methodologies for the Classification of Distributions by Tail Behavior" – Advisor, Javier Rojo; Committee Members, James Thompson & Richard Tapia

M.S.   University of Missouri-Rolla   1996, Rolla MO
         Applied Mathematics and Statistics

B.S.   St. Mary's University (TX)   1994, San Antonio TX
         Electrical Engineering

Experience

Resident Instruction Assistant Professor,   2005-2006
University of Missouri-Columbia
         Introduction to Mathematical Statistics
         Elementary Statistics for Agriculture

Instructor, Rice University   Spring, 2005 Methods
        of Data Analysis and System Optimization

Instructor, Arkansas Governor's School   Summer 2002
Probability and Statistics with NASA Applications

Johnson Space Center   1997-1999 NASA
        Space Shuttle Flight Design Engineer
            - Space Shuttle Landing Team Real Time Support Winds
             Coordinator

Instructor, University of Missouri-Rolla   1995-1996
        Calculus II

MEMC Electronics   1995-1996
        Quality Assurance Summer Intern

Research Grants

Colorado Mesa University & Western Colorado School Districts), Elementary
Mathematics Teacher Coaching Intervention; US Department of Education Grant issued
through Colorado Department of Education, 2013 – 2014; Grant Co-author & Evaluator

Mesa State Middle School Math & Science Partnership Extension Grant; $164,000; "No
Child Left Behind" US Department of Education Grant issued through Colorado
Department of Education, 2010 – 2011; Principal Investigator and Director of Year Long
Professional Development Program for Middle School Math & Science Teachers; Duties
Included Advertising, Registration, Scheduling, Purchasing, Budgeting, Evaluation,
Annual Reporting

Mesa State Middle School Math & Science Partnership; $500,000; "No Child Left
Behind" US Department of Education Grant issued through Colorado Department of
Education, 2007 – 2010; Director of Year Long Professional Development Program for
Middle School Math & Science Teachers; Duties Included Advertising, Registration,
Scheduling, Purchasing, Budgeting, Evaluation, Annual Reporting

United Space Alliance: Applying Extreme Order Statistics Estimation Techniques to
NASA Space Shuttle Global Positioning Satellite System, 2001-2003

RESEARCH ACTIVITY PUBLISHED MANUSCRIPTS

Under review by Journal of Accountancy:

"Ethical Perspectives of Certified Public Accountants and the Cannabis

Industry." Awaiting Journal of Cannabis Research Review (Submitted June 2021); Co-authors Rick Ott and Johnny Snyder.

Owens-Ott, G.S. Accounting and the U.S. Cannabis Industry: Federal Financial Regulations and the Perspectives of Certified Public Accountants and Cannabis Businesses

Owners. *Journal of Cannabis Research. doi: 10.1186/s42238-020-00049-7.* (AACSB IC: Applied Scholarship, PRJ, 12/2020) Acknowledgment

Survival and Plant Vigor of Sclerocactus Parviflorus Following Different Transplanting Techniques, with R. Ballard, T. Novotny, Anna Lincoln, and E. Rechel, Western North American Naturalist, Vol 75, Number 3, 2015

Lower levels of harvest traffic on alfalfa (Medicago sativa L.) have minimum impact on long-term yields, with T. Novotny and E. Rechel, Canadian Journal of Plant Science, Vol. 92, Number 5, Manuscript cjps2012-038, November 2012.

Space Shuttle GPS Figure of Merit Chimney Analysis, United Space Alliance (Johnson Space Center) STF No. AFDDFD-99-48200-112, August 1999 (Classified)

STS-085 Alpha Corridor Violation STAMPS Monte Carlo Simulation Correction Procedure, United Space Alliance (Johnson Space Center), STF No. DFD-97-4235-050, July 1997 (Classified)

Introduction to Statistics for Flight Design (Class Notes) United Space Alliance Flight Design Training Library, Spring 1998

Testing for Tail Behavior Using Extreme Spacings, with J. Rojo, Cornell University Library, Article ID: 1011.6458, Nov. 2010.

Renal Impairment and Cerebral Dysfunction Following Cardiac Surgery: Is Embol-X Cannulation System an Effective Treatment?, with S. McCoy et. al. St. Mary's Regional Medical Center & University of Nebraska Medical Center.

A Binomial Test for Classifying Tail Behavior Using the Residual Life Function and the Extreme Spacing

TRAINING MANUAL

Introduction to Statistics for Flight Design, United Space Alliance (Johnson Space Center), May 1998 (Classified)

STATISTICAL ANALYSIS FOR PH.D. DISSERTATIONS

Assessing the Relationship between Job Satisfaction and Voluntary Turnover of Police Officers in Colorado, John Reece, Northcentral University May 2011

Metacognition Among Students Identified as Gifted or Nongifted Using the Discover Assessment,

W. Leader, University of Arizona May 2008.

Professional Presentations

2005   Colloquium Talk – University of Missouri - Rolla
                                    On the Operating Characteristic of Some Non- parametric
                                    Methodologies for the Classification of Distributions by
                                    Tail behavior

2003   Conference of Texas Statisticians:
                                    On Tail Categorization of Probability Laws

2003   Southern Region Conference of Statisticians:
                                    On Tail Categorization of Probability Laws

2002   Conference of Texas Statisticians:
                                    A Mode Detecting Control Chart,
                                    Poster Award Winner

2002   Southern Region Conference of Statisticians: A
                                    Mode Detecting Control Chart

2001   Conference of Texas Statisticians:
                                    Bootstrapping Extreme Order Statistics Despite A Small
                                    Sample Size

2001   Southern Region Conference of Statisticians: Bootstrapping
                                    Extreme Order Statistics Despite A Small Sample Size

United Space Alliance Invited Presentations

Classifying Population Tails: July 30, 2003

Classifying Population Tails by the Extreme Spacing: May 16, 2003

Classifying Population Tails by the Extreme Spacing: March 7, 2003

Extreme Value Analysis & Software: September 26, 2002

Bayesian Analysis: May 17, 2002

Density Estimation: March 4, 2002

STATISTICS STUDENT RESEARCH COLLABORATIONS (RESULTING IN A PAPER OR PRESENTATION)

Analysis of 2011 Montrose County Citizen Survey, presented by Tyler Nelson, April 2012 Montrose County Commissioner Meeting & Colorado Mesa Student Showcase, Colorado Mesa University

Analysis of 2010 Town of Palisade Community Survey, presented by Alex Hafer, December 2011 Palisade Town Meeting & Mathematics Colloquium, Colorado Mesa University

The Sum of Dependent Chi-Squared Random Variables, presented by Shane Chatfield, David Miller, and Mackenzie Schmalz, May 2010

Johnson Space Center, Houston TX, Sponsored by Colorado NASA Space Consortium Grant

Extreme Value Theory Analysis of Air Pollution in the Grand Valley, presented by Shane Chatfield, April 2010, Mesa State Student Scholar Symposium & Mathematics Colloquium, Mesa State College; **Awarded Symposium Session Winner**

Sticks and Statistics, presented by David Miller, April 2010

Mesa State Student Scholar Symposium & Mathematics Colloquium, Mesa State College

The Effects of Wealth on Childhood Academic Achievement Determinants of Success, presented by Katherine Pearson, April 2009, Mesa State Student Scholar Symposium & Mathematics Colloquium, Mesa State College

Statistical Explanations of the West Nile Virus in Mesa County, presented by Cerise Moran, April 2009, Mesa State Student Scholar Symposium & Mathematics Colloquium, Mesa State College; **Awarded Symposium Session Winner**

That's Not Suppose to Happen!, presented by Mike Burkes, April 2009

Mesa State Student Scholar Symposium & Mathematics Colloquium, Mesa State College

The Random Voting Model, presented by Courtney Gibbon, April 2009

Mesa State Student Scholar Symposium & Mathematics Colloquium, Mesa State College

Logistic Regression Applied to Football, presented by Will Zimmerer, April 2009

Mesa State Student Scholar Symposium & Mathematics Colloquium, Mesa State College

The Gambler's Ruin, presented by Mallory Reid, April 2009

Mesa State Student Scholar Symposium & Mathematics Colloquium, Mesa State College

Application of ANOVA, presented by Katherine Pearson, 2008 Mesa State Mathematics Colloquium, Mesa State College

Cardiac Surgery Embol-X Cannulation Treatment, presented by Mike Burkes, 2008 Mesa State Mathematics Colloquium, Mesa State College

MECHANICAL ENGINEERING STUDENT RESEARCH COLLABORATIONS (RESULTING IN A PAPER OR PRESENTATION)

Monitoring Deviation in Arbitrary Wave Form Generators, presented by Jesse Coquoz & K.C. Bretey, April 2012, Colorado Mesa Student Showcase, Colorado Mesa University

Momentum and Baseball, presented by Brandon Howell and Weston Vorderberg, April 2012 Colorado Mesa Student Showcase, Colorado Mesa University

On Vehicular Spoilers, presented by Isaac Hudson and Kelsi Middleton, April 2012 Colorado Mesa Student Showcase, Colorado Mesa University

The Effects of Humidity on Projectile Motion, presented by Aaron Clymer, April 2011 Colorado Mesa Student Showcase, Colorado Mesa University

Flexural Bending in T4 and T6 Aluminum, presented by Will Lostumbo, April 2011 Colorado Mesa Student Showcase, Colorado Mesa University; **Awarded Showcase Session Winner**

Colorado Mesa Student Showcase, Colorado Mesa University *Projectile Motion Study,* presented by Zack Black, April 2011

Awarded Showcase Session Winner

Testing Coating Thickness vs. Coating Performance, presented by Pace Bates, April 2011 Colorado Mesa Student Showcase, Colorado Mesa University

Statistical Analysis of Input Random Variables that Significantly Impact Whether or Not a Drag Race is Won, presented by Jeremy Styers, April 2011

Colorado Mesa Student Showcase, Colorado Mesa University

SERVICE
COLORADO MESA UNIVERSITY / MESA STATE COLLEGE (Fall 2006-present)

- Tenure & Promotion Committee, 2014 – 2015, 2021 – present
- Faculty Senate, 2019 - 2021
- Academic Policies Committee, Fall 2010 – Spring 2014
  - Vice-chair, Fall 2011 – Spring 2014

- Chair, Fall 2010 – Spring 2011
- Search Committee Chair: Statistics Lecturer Positions, Spring 2012
- Search Committee: Mechanical Engineering Tenure-Track Position, Summer 2012
- Search Committee: Mathematics Tenure-Track Position, Spring 2011
- Search Committee: Mechanical Engineering Tenure-Track Position, Spring 2011
- Search Committee: AmeriCorps Position, Fall 2011
- Textbook Selection Committee Chair: Statistics, Spring 2010
- May Commencement Ceremonies Usher and Photo Section Monitor, 2012, 2011, 2010
- Center of Teacher Education ESOL Capstone Presider, 2009 & 2010
- Organized Visit and Hosted NASA Engineer David Mains for Sigma Xi Science Society, 2010

COMMUNITY

- Science Fair Judge, Spring 2012, Columbine Middle School
- Mesa County School District 51 AP Statistics Examination Preparation Session, Spring 2006 Grand Junction High School
- Faith Sharing Group Leader, Mesa State Catholic Newman Center, 2009-2010, 2014 – present
- Invited Speaker Grand Junction High School Mathematics Club, 2009
- Invited Speaker Garfield Middle School, 2008
- Junior Golf Clinic Volunteer, Tiara Rado Golf Course, 2008
- Treasurer, Lincoln Park Men's Golf Club, 2010-Present

Graduate School Presentations

On Tail Categorization of Probability Distributions, June 2003

Southern Regional Council of Statistics, Jekyll Island GA, Student Poster

Tail Categorization of a Sample, April 2003

Conference of Texas Statisticians, Texas A&M University, Student Poster

A Mode Detecting Control Chart, June 2002

Southern Regional Council of Statistics, Natchez MS, Student Poster

A Mode Detecting Control Chart, April 2002

Conference of Texas Statisticians, Houston TX, Student Poster Award Winner

Bootstrapping Extreme Order Statistics Despite a Small Sample Size, June 2001 Southern Regional Council of Statistics, St. Augustine FL, Student Poster

Bootstrapping Extreme Order Statistics Despite a Small Sample Size, April 2001 Conference of Texas Statisticians, San Antonio TX, Student Poster

United Space Alliance: Applying Extreme Order Statistics Estimation Techniques to NASA Space Shuttle Global Positioning Satellite System, 2001-2003; Principal Investigator – Support for Graduate Research

Honors and Awards

Rice University Graduate Student Service Award	2003
Conference of Texas Statisticians Student Poster Award	2003
University of Missouri-Rolla Chancellor's Fellow	1994-1996
St. Mary's University Honors and Awards	1989-1994

St. Mary's University Honors Program
St. Mary's University IEEE Vice President St.
Mary's University Presidential Award Marianist
Heritage Award
University Alumni Scholar
Dr. Turgut Ozan Outstanding Engineer of the Year Donald
Picha Electrical Engineering Award

Erik S. Packard, Ph.D.

e-mail: epackard@coloradomesa.edu

Program: Mathematics

Department: Mathematics & Statistics

Faculty Rank: Associate Professor

Employment:

1995-current: Colorado Mesa University (formally Mesa State College)

University Degrees:

B.S., Texas Tech University, Mathematics, 1988

M.S., Texas Tech University, Mathematics, 1990

Ph.D., Texas Tech University, Mathematics,

1995

Courses Taught:

MATH 113, College Algebra

MATH 119, Precalculus

Mathematics MATH 121,

Trigonometry

MATH 136, Engineering Calculus

II MATH 151, Calculus I

MATH 152, Calculus II

STAT 200, Probability and Statistics STAT 313,

Sampling Techniques MATH 310, Number Theory

MATH 369, Discrete Structures I

MATH 560, Applied Number Theory

Published Papers:

The order of a Perfect k-shuffle, Fibonacci Quarterly, May, 1994, with Robert W. Packard

A Generalization of the Identity $\cos\frac{\pi}{3}=\frac{1}{2}$, Mathematics Magazine, April 2012, with Markus Reitenbach

Committees:

Assessment Committee, early 2000's

Curriculum Committee, 2007-2011

Sabbatical Committee, 2017-present

Numerous Search Committees

Numerous Book Committees

Numerous minor Committees

Presented Talks:

2002, University of Wyoming, MAA meeting

2004, University of Colorado-Colorado Springs, MAA

meeting 2015, Colorado College, MAA meeting

2016, Colorado Mesa University, MAA meeting

2017, Colorado State University-Pueblo, MAA meeting

2018, Colorado State University, MAA meeting

2019, Fort Lewis College, MAA meeting Numerous local talks at

Colorado Mesa

Supervised Student Projects: Include

the following:

2006-2007, Topic: Quadratic
Reciprocity

2010-2011, Topic: Statistics of the "Hot
Hand" in Basketball 2011-2012, Topic:
Pseudoprimes

 2015: Topic Algebraic Coding

Other:

2004-present, corresponding secretary for Colorado Delta

KME 2004, Book Review, *Basic Practice of Statistics*, by

Moore

1996-present, maintain a website that using a program that I wrote to rank basketball and football teams, a few years ago, CHSAA starting using my system as one of 4 methods to help seed and select teams that make the playoffs in football and basketball. www.coloradomesa.edu/~epackard

Markus Reitenbach, Ph.D.

Employment

Associate Professor, Colorado Mesa University, 2013–

Assistant Professor, Colorado Mesa University, 2006–2013

Teaching Postdoctoral Fellow, Syracuse University, 2005–2006

Education

Institutions Attended

- Syracuse University, 2001–2005
- University of California, Santa Barbara, 2000–2001
- University of Ulm, Germany, 1998–2000
- Syracuse University, 1997–1998
- University of Ulm, Germany, 1993–1997

Degrees

- Ph.D. in Mathematics, Syracuse University, Aug 2005
  Dissertation: "A Homological Approach to Differentiation Algorithms and
  Dimensions of Finite Type for Representations of Partially Ordered Sets"
- Certificate in University Teaching, Syracuse University, Aug 2005
- Diploma, Math Major, Operations Research Minor, University of Ulm, May 2000
- M.S. in Mathematics, Syracuse University, May 1998

Teaching Experience

Courses Taught

- College Mathematics
- College Algebra
- Precalculus
- Calculus I, II, III
- Calculus for Biological Sciences
- Differential Equations and Linear Algebra for Engineers
- Differential Equations
- Applied Linear Algebra

- Linear Algebra

- Discrete Structures

- Introduction to Advanced Mathematics

- Number Theory

- Real Analysis I, II

- Complex Variables

- Abstract Algebra I, II

- Topology

- Probability and Statistics

- Mathematics Colloquium

- Senior Seminar I, II

- Applied Cryptography (graduate level)

- Maverick Milestone: Bitcoin

Teaching Fellow at Syracuse University, 2003–2005
Responsible for leading TA training sessions during the campus-wide TA orientation of the Graduate School

Course Developer at Syracuse University, Fall 2004
Responsible for designing weekly worksheets and overseeing the undergraduate facilitators' work at the "Academic Excellence Workshop" in the College of Engineering and Computer Science

Awards

Sabbatical Leave, CMU, 2017

Project NExT Fellowship, American Mathematical Society, 2006

Outstanding TA Award, Syracuse University, Apr 2004

National Science Foundation travel support for participation at the Weekend Algebra Conference, Florida Atlantic University, DMS 0305906, Nov 2003

National Science Foundation summer support, DMS 0070807, Principal Investigator: T. Iwaniec, Summer 2003

Fulbright Scholarship, visiting fellow at Syracuse University, 1997–1998

Service

Faculty Senate, CMU, 2021–

Scholarship Review Committee, CMU, 2020– Tutorial Services

Advisory Committee, CMU, 2007–

Pre-tenure Review Committee, CMU, 2013–2021 (chair 2016–2020) Tenure and

Promotion Committee, CMU, 2019–2021

Assessment Committee, CMU, 2007–2013, 2018–2019

Departmental hiring, textbook and curriculum committees, CMU, 2007–

Judge for poster session at AMS Meeting, New Orleans, Jan 2007

"Excellence in Graduate Education Faculty Recognition Award" Selection Committee, Syracuse, Spring 2005

Regional Preparing Future Faculty (PFF) Program Steering Committee, Syracuse, 2004–2006

Departmental Undergraduate Committee, Syracuse, 2003–2004

Mathematics Graduate Organization Colloquium Organizer, Syracuse, 2002–2003

Peer-Reviewed Publications

"Teaching Proof-Writing by Public Grading", book chapter in *Beyond Lecture: Resources and Pedagogical Techniques for Enhancing the Teaching of Proof-writing Across the Curriculum*, Mathematical Association of America, 2016

"A Generalization of the identity $\frac{\pi}{3} = \frac{1}{2}$", *Mathematics Magazine* **85** (April 2012), 124-125 (with Erik Packard)

"Adjoint Functors, Projectivization, and Differentiation Algorithms for Representations of Partially Ordered Sets", *Journal of Algebra* **353** (2012), 224-248 (with Mark Kleiner)

Research Interests

Representations of partially ordered sets

Homological algebra

Neural networks in finance Cryptography of

cryptocurrencies

Molly Ryan

Instructor of Mathematics

Colorado Mesa University

Education:

- MA, Counseling: Concentration in K-12 School Counseling Adams State College, 2010

- Graduate Certificate in Applied Mathematics Colorado Mesa University, 2019

- BS, Mathematics: Concentration in Secondary Education
  University of Northern Colorado, 2005

Teaching 2010-Present:

Courses Taught

- MATH 101, Topics in Algebra
- MATH 110, College Math
- MATH 113, College Algebra
- MATH 060, MATH 090, MATH 091 Developmental Math

Evidence of Continuous Improvement

- Welcome Back and Faculty Development, Fall 2021
- "Social" Distance Education Webinar Series, Summer and Fall 2020
- Lumen OHM Platform Training, August 2020
- Committee to design MATH 110, Summer 2019
- Dr. John Nicoletti's Workshop on Campus Safety and Threat Assessment October 15, 2019
- CMU's Meeting with Dr. Donna Beegle on Breaking Barriers for Students in/from Poverty on January 12, 2017
- Facilitated Early Scholars committee, 2017
- CMU's Course Meeting "Critical Thinking Unmasked: How to Infuse it into a Discipline Based" presented by Dr. Linda Nilson, Clemson University on Friday, August 19, 2016
- CMU's Safe Zone Training on April 18, 2016 at 3:30pm
- CMU's Distance Education Training "The Gift of Gab" on March 24, 2016
- CMU's Classroom Management Training Sessions for Faculty on January 15, 2016
- Developed MATH 101 Summer 2015
- CMU's Meeting with Dr. Jeff Rosen, HLC Vice President for Accreditation

- Relations, regarding changes to theaccreditation process on January 14, 2015
- CMU Distance Education's Webinar "50 Shades of Grades - Gradebook Help" on December 1, 2015
- Attended all three sessions (Campus Safety, Suicide Prevention Efforts, Sexual Assault Harassment Prevention) ofCMU's Campus In-service Training on March 3, 2015
- CMU's faculty colloquium with Dr. Jennifer Daniels presenting on an investigation into STEM Education and Experiential Learning on February 18, 2015
- CMU's FERPA Training Sessions for Faculty on February 4, 2015
- CMU's Program Assessment and Reporting Meeting with Dr. Gloria Rogers on January 14, 2015
- Dr. John Nicoletti's Workshop on Campus Safety Education and Awareness, February 12, 2014
- Dr. Terrel Rhodes's Workshop on Rubrics and ePortfolios January 16 and 17, 2014

Service 2013-Present:

<u>Department</u>

- Regularly teach overloads to cover essential learning classes
- Attend department meetings
- Taught special section of Math 113 as needed for students needing extra support
- Participate in FCoP Department, Math 110, Math 113
- Served on several Math 110 Book Selection Committee
- Serve on the Math 110 Development Committee beginning in 2019
- Served on several Math 113 Book Selection Committee

Advising 2010-Present:

<u>University level</u>

- Informally advise students on courses to take and other academic decisions
- Numerous letters of recommendation

Daniel D. Schultz-Ela

dschultz@coloradomesa.edu
(970) 248-1496

Department of Mathematics &
  Statistics
Colorado Mesa University
1100 North Avenue
Grand Junction, CO 81501

EMPLOYMENT:

2006–present **Colorado Mesa University**: Assistant, Associate, Full
   Professor of Mathematics Education.

2005–2006   **Colorado Mesa University**: Mathematics Instructor.

2004–2005   **Hotchkiss K-8 School**: Teacher, 8th-grade Mathematics, Reading, and
English. 1989–2004   **University of Texas at Austin**: Research Associate, Research
Scientist.

1986–1988   **Colorado College**: Instructor, Assistant Professor.

1982–86   **University of Minnesota**: Teaching Assistant, Research
Assistant. 1981–82 **Brown University**: Teaching Assistant, Research
Assistant.

Summer 1978 **Bendix Field Engineering**, Grand Jct. CO: Geophysical assistant, NURE
           project.

EDUCATION:

2007–10   **Western Governors University**: Mathematics Education, M.A.

2004–05   **Western State College**: Education courses culminating in secondary
licensure.

2003   **Austin Community College**: Biology courses for secondary science

           endorsement.
1982–88   **University of Minnesota**: Geology, Ph.D.
1980–82   **Brown University**: Geological Sciences,
Sc.M.

1978–80   **University of Otago** (New Zealand): Geology research under Fulbright
grant.

1974–78   **Carleton College**: Geology, B.A. Magna cum Laude with Distinction in
major.

TEACHING EXPERIENCE:
   Colorado Mesa University   *Instructor through Professor*   Grand Junction,
   Colorado

   - Methods of Teaching Secondary Mathematics

- Euclidean Geometry: Revived as an active-learning course for pre-service elementary teachers (completely redesigned course)
- Ethnomathematics
- Mathematics for Elementary Teachers
    - Completely restructured three-course sequence
- Elements of Mathematics II
    - to emphasize conceptual/discovery learning
- Elements of Mathematics I
    - while retaining content mastery; new text
- Technology for Mathematics Educators: introduction to programming using spreadsheets and visually-oriented methods, web page design (new course)
- Explorations in Mathematics for Elementary Educators: guided readings to broaden mathematical perspectives (designed new course)
- College Algebra: traditional and problem-solving approaches
- College Mathematics: traditional, flipped class using *i*-clickers, and guided-inquiry
- Probability and Statistics
- Calculus for Business
- Intermediate Algebra, Introductory Algebra
- Natural Hazards: Integration of geosciences (me) and emergency management

Hotchkiss K-8 School: *Certified Secondary Teacher* Hotchkiss, Colorado

- 8th-grade Mathematics: Two levels, trad'l and Integrated Math Program approaches
- 7th-grade Mathematics: Integrated Math Program course for high achievers
- 8th-grade English: Core Knowledge program
- 8th-grade Reading: Core Knowledge program

Colorado College: *Instructor, Assistant Professor* Colorado Springs, Colorado

- Plate Tectonics
- Structural Geology: (2 blocks) Included lab and extended field-mapping components
- Introduction to Petrology: Included lab and intensive field-based components
- Physical Geology: (2 blocks) Included lab and intensive field-based components
- Geology of Utah's Canyon Country: New field-oriented intro. experiential course
- Geology of the Pikes Peak Region: Field-oriented introductory experiential course
- Summer Field Geology Seminar for high-school students – NSF Young Scholars program

University of Minnesota *Teaching Assistant* Minneapolis, Minnesota

- Preparation and teaching of laboratories for six geology courses, including

three field camps

Brown University   *Teaching Assistant*   Providence, Rhode Island

- Preparation and teaching of laboratories for two geology courses

University of Otago: *Teaching Assistant*   Dunedin, New Zealand

- Laboratory for Introduction to Geology

Carleton College: *Teaching Assistant*   Northfield, Minnesota

- Preparation and teaching of laboratories for two geology courses

RESEARCH EXPERIENCE:

Colorado Mesa University: Action research to increase mathematical communication ability in pre-service elementary teachers. Mathematica simulations and graphs of stress fields around numerical models of pressurized boreholes. Supervision of multiple senior projects in mathematics applied to physical science modeling.

University of Texas at Austin: Numerical modeling of deformation in brittle-ductile geologic systems. Deformation laws for geologic materials. Field analysis and computer modeling of grabens in Canyonlands National Park. Mathematical curvature analysis. Development of a commercial Macintosh program.

University of Minnesota: Three-dimensional strain patterns: computer reconstruction of regional strains from measurements. Statistical analysis of orientation distributions.

Brown University: Rate- and state-equations for earthquakes, experimental frictional sliding of rocks and earthquake processes, experimental rock deformation at high temperatures and pressures, theoretical heat and mass transfer.

University of Otago: Statistical orientation analysis of crystallographic preferred orientations, field and microfabric analysis to decipher deformation and metamorphic reaction history.

Bendix Corp.: Geophysical Field Techniques – surveys over known uranium deposits to evaluate techniques normally reserved for other types of economic deposits.

Carleton College: Microfabric analysis of an Archean gneiss complex, central Minnesota.

HONORS:

Exemplary faculty performance rating. Colorado Mesa University, 2009, 2011, 2012. George C. Matson Award for best paper at the annual convention of the American

     Association of Petroleum Geologists (co-author); 2006.

Doctoral Dissertation Fellowship (university-wide), University of Minnesota, 1983-84. Lando Fund Fellowship, University of Minnesota, winter & summer 1983.
University Fellowship (university-wide), Brown University, 1980-81.
Fulbright Full Grant for graduate study and research in New Zealand, 1978-80.
National Science Foundation Graduate Fellowship, 1978 – declined for Fulbright Grant. Graduation Magna Cum Laude with Distinction in Geology, Carleton College, 1978.
Duncan Stewart Fellowship, Carleton College, 1977-78.

GRANTS and FUNDING:

Faculty Professional Development Fund – License and support for Mathematica, 2018-19. NSF Math and Science Partnership Program – Colo. St. Univ. STEM Secondary Colorado
>Education Urban and Rural Innovation in Teacher Education Partnership (Co-PI). Rejected: proposal for 2013-2017, Colorado Mesa University, *$809,913 for CMU*.

Texas Advanced Research Grant – Numerical models of brittle grabens forming above ductile rock in Canyonlands National Park (PI), University of Texas, 1998-99, *$74,906*.

Texas Advanced Technology Grant – Computer modeling of hydrocarbon traps formed around deformed salt sheets in the Gulf of Mexico (PI), University of Texas, 1996-97, *$89,938*.

Funding from Industrial Associates to support Applied Geodynamics Laboratory (group of four researchers led by Dr. Martin Jackson), University of Texas, 1989-04, *~$450,000/yr*.

Texas Advanced Research Grant – Mechanics of active salt diapirism (co-authored with PI Dr. Martin Jackson), University of Texas, 1994-95, *$160,000*.

Texas Advanced Research Grant – Rollover kinematics of growth faults (co-authored with PI Dr. Martin Jackson), University of Texas, 1990-91, *$140,000*.

NSF Young Scholars Program – Summer Field Geology Seminar (with Dr. Eiler Henrickson), Colorado College, 1988, *$66,770*.

PROFESSIONAL CERTIFICATIONS:

Secondary Teaching certificate, State of Colorado, endorsements in Mathematics and Science, highly qualified in English and Reading Teacher.

PROFESSIONAL SOCIETIES:

- National Council of Teachers of Mathematics
- Mathematical Association of America
- Colorado Council of Teachers of Mathematics
- American Geophysical Union
- Kappa Mu Epsilon

PROFESSIONAL SERVICE:

College Committees:

- Undergraduate Curriculum Committee
- Distinguished Faculty Award Committee (chair, three years)
- Faculty Senate and Executive Committee (six years, and Secretary, five years)
- Educational Access Services (campus-wide)
- Assessment and e-Portfolio Working Group
- General Education Review, subcommittee exploring ePortfolios (campus-wide)
- Faculty Handbook Review task force (campus-wide)
- Tenure and Promotion (campus-wide, four times)
- Education Dept. NCATE report for reaccreditation

Advising

- Elementary Education Mathematics concentrators (currently 51 advisees)
- Mathematics majors concentrating in Secondary Education (currently 14 advisees)

College Service

- Affirmative Action representative for many faculty searches
- Supervisor for secondary mathematics interns (student teachers)
- Instructor for portions of Geology field courses
- Student Scholars symposium moderator and judge
- Supervisory assistance for senior research project in Geology
- Piloted use and evaluation of VALUES rubrics
- Marshall in graduation ceremonies

Departmental Service

- Chair, search committees for Mathematics and Mathematics Education instructors
- Member, search committees for Mathematics, Applied Mathematics, and Teacher Ed. Assistant Professors
- Senior project supervisor (one student every year 2008-2017)
- Reader for senior project reports
- Departmental program review; chair of Mathematics Education portion
- Mathematics Program Working Group (propose and implement improvements)
- Textbooks for Elementary Math Education (chair), College Algebra (chair) and College Mathematics (chair)
- Outstanding mathematics graduate selection committee
- Kappa Mu Epsilon selection committee

Professional Service

- Review for publisher of new edition of Mathematics for Elementary Teachers textbook and reviewed and piloted a chapter of a College Mathematics text

Community Service

- Trustee of the philanthropic Goodwin Foundation ($3.6 million fund).
- Board member of the Rogers Mesa Domestic Water District.
- District 51 Vertical Alignment Team to restructure secondary curriculum
- Leader five geology field trips for North Fork outing club (Women on the Move)
- Science Fair judge
- Tutor (volunteer) for home-schooled Calculus student

Peer reviewer
- National Science Foundation (grant applications)
- American Association of Petroleum Geologists Bulletin
- Geological Society of America Bulletin
- Journal of Structural Geology
- Tectonophysics
- Marine and Petroleum Geology
- Society of Petroleum Engineers.

PROFESSIONAL DEVELOPMENT:

National Council of Teachers of Mathematics: NCTM Virtual Annual Meeting, April 21-May 1, 2021.

Mathematical Sciences Research Institute (MSRI) workshop "Critical Issues in Mathematics Education 2020: Today's Mathematics, Social Justice, and Implications for Schools workshop" University of California, Berkeley, March, 2020.

MSRI workshop "Critical Issues in Mathematics Education 2019: Mathematical Modeling in K-16: Community and Cultural Contexts." University of California, Berkeley, March, 2019.

National IBL Conference "Inquiry-Based Learning and Teaching in Mathematics." University of Texas at Austin, May 2018.

MSRI workshop "Critical Issues in Mathematics Education 2018: Access to mathematics by opening doors for students currently excluded from mathematics." University of California, Berkeley, February, 2018.

MSRI workshop "Critical Issues in Mathematics Education 2016: Observing, Evaluating and Improving Mathematics Teaching from the Early Grades through the University." University of California, Berkeley, February, 2016.

MSRI workshop "Critical Issues in Mathematics Education 2014: The Role of the Mathematics Department in the Mathematical Preparation of Teachers." University of California, Berkeley, March 2014.

MSRI workshop "Critical Issues in Mathematics Education 2013: Assessment of Mathematical Proficiencies in the Age of the Common Core." University of California, Berkeley, May 2013.

MSRI workshop "Critical Issues in Mathematics Education 2011: Mathematical Education of Teachers." University of California, Berkeley, May 2011.

Completed M.A., Mathematics Education through Western Governors University (NCATE accredited); June 2010. Research and curriculum development for teaching mathematical communication.

MSRI workshop "Critical Issues in Mathematics Education: Reasoning and Sense-Making in the Math Curriculum." University of California, Berkeley, June 2010.

MSRI workshop "Critical Issues in Mathematics Education: Teaching Undergraduates Mathematics." University of California, Berkeley, May 2009.

Mathematical Association of America PREP workshop "Active Learning Approaches and Visual Methods for Teaching the Foundational Mathematics for Elementary Teachers Courses." Western Oregon University, Monmouth, July 2008.

McGraw-Hill Publishing: College Algebra Symposium, Tucson, AZ, February 2008.

Institute for Mathematics and Education workshop "Elementary Teacher Preparation in Mathematics." University of Arizona, Tucson, February 2008.

Mathematical Association of America PREP workshop "Revitalizing College Algebra." University of Arizona, Tucson, June 2007.

Colorado State University, Pueblo, mini-conference "Mathematics for Prospective Elementary Teachers." September 2006.

Many, many online workshops (webinars).

PRESENTATIONS:

Stress Patterns around Pressurized Elliptical Holes in Tectonic Regimes and Implications for Fracture Propagation and Caging. American Geophysical Union Annual Meeting, Dec. 2019 (accepted, but not presented due to funding).

Comparison of Teaching Approaches for Liberal-Arts Mathematics. Joint meeting of Rocky Mountain and Intermountain sections of the Mathematical Association of America, 2016, Abstracts of Papers, p. 23.

To Flip or Not to Flip: Flipped Classroom 101 (Panelist for discussion). 57th Annual Global Mountain Plains Business Conference, September 2015.

Instruction in mathematical communication through problem-solving explanations. Mathematical Association of America Mathfest, May 2011.

Presentations at Colorado Mesa University Mathematics Colloquia:

> Mooving Cows and Busy Dogs Prefer North (Statistics of directional data). October 2014 and March 2016.
>
> Geometry of Equations: Straight Lines Define Curves, Curves Define Cusps. March, 2014
>
> Algebra for Teaching vs. the Algebra We Teach. November 2012.
>
> Numerical Modeling of Geological Structures in Canyonlands National Park. April 2012 and March 2006.
>
> The Meaning of Times? – Repeated Addition, Implications for Teaching, and Fraction Division. March 2011.
>
> Harmonic Functions and Biharmonic Equations: A Few Solutions Fit Many Applications. Nov. 2009.
>
> Does North Mean South? The Wacky World of Periodic Data Statistics. September, 2008.
>
> Fractions: How Hard Can They Be? November 2007.
>
> Biharmonic Equations, Shiprock, and How's Your Stress Function? April 2007
>
> On Average, We're Going Backwards: Statistics of Directional Data. October 2005

How squishy salt formed the landscapes of Arches and Canyonlands National Parks: presented to Hotchkiss K-8 community, May 2005.

Numerous older talks at professional conferences, list available upon request.

MENTORED SENIOR RESEARCH PRESENTATIONS:

Williams, Andrew, April 2019. The Effectiveness of Portfolios as an Alternative Summative Assessment. Presented to Mathematics Capstone and Student Scholars Symposium.

Fuller, Brandon, April 2019. Extracurricular Activities and Student Achievement. Presented to Mathematics Capstone and Student Scholars Symposium.

Bleazard, Fawn, April 2017. Mathematical Modeling of Avalanche Flow. Presented to Mathematics Colloquium and Student Scholars Symposium.

De Puey, Noelle, April 2015. Seismic Exploration. Presented to Mathematics Colloquium and Student Scholars Symposium.

Driskill, Ian, May 2014. Heat Transfer and Insulation. Presented to Mathematics Colloquium and Student Scholars Symposium.

Regimbal, Kelly, April 2013. Applications of the Fourier Transform in Seismic Processing. Presented to Mathematics Colloquium and Student Scholars Symposium.

Takaki, Yeonshim, February 2013. Let it Flow (Mathematical modeling of fracture propagation from pressurized boreholes). Presented to Mathematics Colloquium.

Straw, Samantha, April 2011. Mathematical Model of Elastic Deformation. Presented to Mathematics Colloquium and Student Scholars Symposium.

Downing, Tyler, April 2010. A Mathematical Model of Salinity in the Colorado River. Presented to Mathematics Colloquium and Student Scholars Symposium.

Langner, Sydney, May 2009. Mathematical Modeling of Influences on Whale Migration Patterns. Presented to Mathematics Colloquium and Student Scholars Symposium.

Miles, Eric, May 2008. An Introduction to the Numerical Computation of the Schwarz-Christoffel Transformation (co-mentor: C. Bonan-Hamada did the bulk of the advising). Presented to Mathematics Colloquium and Student Scholars Symposium.

DISSERTATION:

Strain patterns and deformation history of the Vermilion district, Minnesota: Minneapolis, University of Minnesota, Ph.D. dissertation, 1988; Dr. P. J. Hudleston, adviser.

M.A. MATHEMATICS EDUCATION:

Mathematical Explanation Instruction: Western Governor's University, Action research report (101 p. thesis equivalent) and instructional unit, 2010; Dr. A. Izumi, adviser.

PUBLICATIONS – *Journal Articles (peer reviewed):*

Weijermars, R., Zhang, Xi and Schultz-Ela, D., 2013. Geomechanics of fracture caging in wellbores. *Geophysical Journal International*, v. 193, p. 1119-1132.

Weijermars, R., Zhang, Xi and Schultz-Ela, D., 2012. Unrecognized 'fracture caging' could make shale drilling safer and more profitable. *First Break*, v. 30(2), p. 35-36.

Weijermars, R. and Schultz-Ela, D., 2012. Visualizing stress trajectories around pressurized wellbores. SPE/EAGE European Unconventional Resources Conference, March 2012, Paper SPE 152559, 10 p.

Hudec, M. R., Jackson, M. P. A., and Schultz-Ela, D. D., 2009. The paradox of minibasin subsidence into salt: Clues to the evolution of crustal basins. *Geological Society of America Bulletin*, v. 121, p. 201-221.

Schultz-Ela, D. D., 2003. Origin of "drag" folds bordering salt diapirs: *American Association Petroleum Geologists Bulletin*, v. 87, p. 757–780.

Walsh, P., and Schultz-Ela, D. D., 2003. Mechanics of graben evolution in Canyonlands National Park, Utah: *Geological Society of America Bulletin*, v. 115, p. 259–270.

Schultz-Ela, D. D., and Walsh, P., 2002. Modeling of grabens extending above evaporites in Canyonlands National Park, Utah: *Journal of Structural Geology*, v. 24, p. 247-275.

Schultz-Ela, D. D., 2001. Excursus on gravity gliding and gravity spreading: *Journal of Structural Geology*, v. 23, p. 725-731.

Laubach, S. E., Schultz-Ela, D. D., and Tyler, R., 2000. Differential compaction of interbedded sandstone and coal. *In* Cosgrove, J. W. and Ameen, M. S., eds., *Forced Folds and Fractures*, Geological Society of London, Special Pub. 169, p. 51–60.

Jackson, M. P. A., Schultz-Ela, D. D., Hudec, M. R., Watson, I. A., and Porter, M. L., 1998. Structure and evolution of Upheaval Dome: A pinched-off salt diapir. *Geological Society of America Bulletin*, v. 110, p. 1547-1573.

Schultz-Ela, D. D. and Jackson, M. P. A., 1996. Relation of subsalt structures to suprasalt structures during extension. *American Association of Petroleum Geologists Bulletin*, v. 80.

Jackson, M. P. A., Vendeville, B. C., and Schultz-Ela, D. D., 1994. Salt-related structures in the Gulf of Mexico: a field guide for geophysicists. *The Leading Edge*, August, p. 837-842.

Jackson, M. P. A., Vendeville, B. C., and Schultz-Ela, D. D., 1994. Structural dynamics of salt systems. *Annual Review of Earth and Planetary Sciences*, v. 22, p. 93-117.

Schultz-Ela, D. D., Vendeville, B. C., and Jackson, M. P. A., 1994. Mechanics of active salt diapirism. *The University of Texas at Austin, Bureau of Economic Geology Report of Investigations* No. 224, 56 p.

Laubach, S. E., Schultz-Ela, D. D., and Tyler, Roger, 1993. Analysis of compaction effects on coal fracture patterns, Upper Cretaceous Rock Springs Formation, southwestern Wyoming. *The Mountain Geologist*, v. 30, p. 95-110.

Schultz-Ela, D. D., Jackson, M. P. A., and Vendeville, B. C., 1993. Mechanics of active salt diapirism. *Tectonophysics*, v. 228, p. 275-312.

Schultz-Ela, D. D., 1992. Restoration of cross sections to constrain deformation processes of extensional terranes. *Marine and Petroleum Geology*, v. 9, p. 372-388.

Schultz-Ela, D. D., and Yeh, J. S., 1992. Predicting fracture permeability from bed curvature, *in* Tillerson, J. R., and Wawersik, W. R., eds., *Rock mechanics: Proceedings, 33rd U.S. symposium*: Rotterdam, Balkema, p. 579-589.

Milling, M. E., Jackson, M. P. A., Kerans, Charles, and Schultz-Ela, D. D., 1991. Advanced geoscience technology can optimize hydrocarbon exploration and recovery efficiency. *Geotimes*, v. 36, p. 20-22.

Schultz-Ela, D. D., 1991. Practical restoration of extensional cross sections. *Geobyte*, v. 6, p 14-23.

Schultz-Ela, D. D., and Duncan, Ken, 1991. *Restore*© user's manual and software. *The University of Texas at Austin, Bureau of Economic Geology*, 75 p., 1 disk.

Schultz-Ela, D. D., and Hudleston, P. J., 1991. Strain in an Archean greenstone belt of Minnesota. *Tectonophysics*, v. 190, p. 233-268.

Schultz-Ela, D. D., 1990. A method for estimating errors in calculated strains. *Journal of Structural Geology*, v. 12, p. 939-943.

Hudleston, P.J., Schultz-Ela, D. and Southwick, D., 1988. Transpression in an Archean greenstone belt of northern Minnesota. *Canadian Journal of Earth Sciences,* v. 25, p. 1060-1068.

Schultz-Ela, D., 1988. Application of a three-dimensional finite element method to strain- field analyses. *Journal of Structural Geology,* v. 10, p. 263-272.

PUBLICATIONS –*Abstracts at CMU:*

Schultz-Ela, D., 2011. Instruction in mathematical communication through problem- solving explanations. Mathematical Association of America Mathfest 2011, Abstracts of Papers, p. 29-30.

37 additional peer-reviewed published abstracts for presentations at national meetings; list available upon request.

REFERENCES:

Dr. Lisa Driskell. Colorado Mesa University, Dept. of Mathematics and Statistics.
1100 North Ave, Grand Junction, CO 81501. (970-248-1407), ldriskel@coloradomesa.edu [*Head of department*]

Mr. Richard Hypio. Hotchkiss High School, 438 Bulldog St., Hotchkiss, CO 81419 (970-872-1168) [*Assistant Principal and mentor at Hotchkiss K-8*]

Dr. Eric Leonard. Dept. of Geology, Colorado College, Colorado Springs, CO 80903. (719-389-6513), eleonard@ColoradoCollege.edu [*colleague at Colorado College*]

Leo B. Seligson
Start Year: 2019

Program:

Mathematics

Department:
Computer Sciences, Mathematics, and Statistics

Faculty Rank

Instructor

Highest Degree

MA   University of Michigan – Dearborn
Master of Arts in Teaching (MAT; Major; Mathematics 2014)

Education:

6 graduate credits, Mathematics, University of West Florida, 2019

State of Florida Professional Educator's Certificate, Biology 6-12,

Mathematics 6-12, 2017-2022 12 graduate credits, Mathematics,

Wayne State University, 2017

State of Michigan Secondary Provisional, Biology 6-12,

Mathematics 6-12, 2014-2020

Master of Arts in Teaching, Math and Biology, University

of Michigan - Dearborn, 2014

6 graduate credits, Business, Walsh College, 2003

Bachelor of Religious Education, Rochester University, 2000

Professional Memberships
National Council of Teachers of
Mathematics (2014)

Michigan Council of Teachers of
Mathematics (2014)

Detroit Area Council of Teachers of
Mathematics (2014)

Service 2003-Present:

<u>Local</u>

Math Teacher Mentor, Eastpoint FL**,**
2018-2019
Chess Club Sponsor, Eastpoint FL, 2017-
2018
Class of 2019 Sponsor, Center Line Ml,
2017
Robotics Team Mentor, Center Line
MI, 2014-2017

Honors and Awards 2003-Present:

<u>Local</u>

Teacher of the Month, Eastpoint FL,
2017-2019
Teacher of the Month, Center Line MI,
2014-2017

Professional Experience:

Mathematics Teacher, Franklin County Schools FL, 2017-2018. Taught Honors Geometry, Geometry, Liberal Arts Mathematics, and Math for College Readiness.

Mathematics and Biology Teacher, Center Line Public Schools MI, 2014-2017. Taught Algebra 1, Honors Biology, and Biology.

Mathematics Adjunct Instructor, International Academy of Design and Technology, Troy MI, 2014. Taught College Algebra in an accelerated course.

Passed Actuarial Exam I/P, July 30, 2012

Passed Actuarial Exam 2/ FM, December 13, 2012

Curriculum Vitae

Patrick Snyder

EDUCATION

M.S. Mathematics   Western Illinois University

B.S. Mathematics   Colorado Mesa University

Thesis: "Title: Does Ordering Matter? The Metamathematics of

Satisfaction"

TEACHING EXPERIENCE

Professional Experience

Mathematics Instructor: Colorado Mesa University

- 2016- Current
    - Have taught the following courses: Math 101 Review for College Algebra, Math 110 College Mathematics, Math 110 Mathematical Investigations, Math 113 College Algebra, Math 119 Precalculus, Math 130 Trigonometry, Math 135 Engineering Calculus I, Math 136 Engineering Calculus II, Math 151 Calculus, Math 236 Differential Equations and Linear Algebra, Math 253 Calculus III

Graduate experience

- Instructor: Math 099
    - Designed syllabus and lecture notes, proctored, and graded all class materials, student evaluations came back with at 4.65 out of 5 for overall experience

- Laboratory Instructor: Math 099
    - Provided hands-on instruction with information provided by lecturer, proctored, and graded tests/quizzes; student evaluations came back with a 4.15 out of 5 for overall experience

Tutoring

Provided tutoring assistance for the following courses: 099-Intermediate Algebra, 100-Core Competencies in Mathematics, 123-Modular Mathematic Functions, 128-Precalculus and Algebra, 133- Calculus and Analytic Geometry, 134-Calculus and Analytic Geometry II, 171-General Elementary Statistics

INSTITUTIONAL EXPERIENCE

- Math 113 Hiring Committee Member (Summer 2019)
    - o Assisted with the selection and review of numerous applicants regarding Math 113 College Algebra

- Math 119 Textbook Selection Committee Member
    - o Assisted with the review and adoption of a Math 119 Precalculus text

- Accuplacer Committee Member (Spring 2018)
    - o Reviewed content regarding the original application, execution, and implementation of the Accuplacer cut scores. This included review of existing material, testing cut score application and overall placement for students. Ended in February with an in-state conference.

RELATED EXPERIENCE

Seminar Course: Teaching

Methods Student   2015

The course was designed with multiple presentations on various topics covering the Math 099 course, where discussion ensued afterwards regarding presentation style.

English Tutoring for Hispanic Migrant

  Workers Instructor   2006-2007

Week course teaching migrant field workers English phrases and language

skills. LANGUAGES

English-native

Spanish-read/write and conversationally adept

EDUCATION

Ph.D. in Mathematics, University of Oregon, Eugene, OR 2018

M.S. in Mathematics, University of Oregon, Eugene, OR 2017

B.S. in Mathematics, University of Oregon, Eugene, OR 2014

P.G.D.E. (Post-Graduate Diploma in Education), Secondary School 2008
Mathematics, University of Hong Kong

B.B.A in Economics, Colorado Mesa University, Grand Junction, CO 2004

EXPERIENCE

Instructor, Mathematics Department, Colorado Mesa University 2018-current

Instructor (Graduate Employee), Mathematics Department, University of 2014-2018
Oregon

  Instructional Specialist, Math Resource Center, Lane Community 2012-2014
    College, Eugene, Oregon

Undergraduate Teaching Assistant, Mathematics Department, University of 2013-2014
Oregon

  Mathematics Tutor and Library Assistant, Mathematics & Science 2013-2014
    Libraries, University of Oregon

Instructor of Mathematics, Sylvan Learning Center, Eugene, Oregon 2011-2013

Mathematics Teacher, South Island School, Hong 2009-2010
Kong Student teacher from 2007-2008

Instructor of Mathematics and English, Sylvan Learning Center, Hong Kong 2007-2009

ESL Teacher, Wall Street Institute, Hong Kong 2006-2007

Tutor, Colorado Mesa University 2003-2004
  - Worked in a drop-in mathematics help lab and tutored small
    groups of 1-5 college students in Calculus, Algebra, Statistics,
    Management, Economics, and Accounting

AWARDS

Graduate Research Award Nominee, Mathematics Department, University of 2017

Summa Cum Laude, Colorado Mesa University	2004
President's List, Colorado Mesa University	2003, 2004

PROFESSIONAL CERTIFICATION

AMA	2010
Certificate of Registration as a Teacher (Hong Kong Special Administrative	

PROFESSIONAL DEVELOPMENT & WORKSHOPS

Math 607: Teaching Mathematics Seminar	2014
Video of Math 111 teaching (with consultation), Teaching Engagement Program & the Center for Media and Educational Technology,	2014
Math 407: Undergraduate TA Training Seminar	2013

CONFERENCES ATTENDED

MAA, Rocky Mountain Section	April 2019
WARTHOG (Workshop on Algebra and Representation Theory Held on Oregonian Grounds) – Symplectic duality (the Abelian case)	August 2017
MSRI (Mathematical Sciences Research Institute) Summer School – Soergel Bimodules, UC Berkeley	June-July 2017
WARTHOG (Workshop on Algebra and Representation Theory Held on Oregonian Grounds) – Knot homologies, Hilbert schemes, and	August 2016

SCHOLARLY ACTIVITY

Unpublished research

A Categorification of the Positive Half of Quantum sl3 at a Prime Root of Unity

Published Work

Contributed Chapter 7, How to Draw Monoidal Categories, to the book Introduction to Soergel bimodules, Springer 2020

PRESENTATIONS

A Categorification of the Positive Half of Quantum sl3 at a prime root of unity, Student Algebra Seminar, University of Oregon

May 2017

Representations of Quantum sl2, Math 683: Representation Theory Seminar, University of Oregon

May 2017

p-DG Algebras, Student Algebra Seminar, University of Oregon

February 2017

The nilHecke Algebra and its Diagrammatics, Student Algebra Seminar,

November 2016

SERVICE

Working Group Member, Math 110 Redesign, Colorado Mesa University
2020-2021

Station Leader, Math Extravaganza, Colorado Mesa University
2020

Sole Planner and Instructor, Middle/High School Math Camp, Colorado Mesa
2019

Volunteer Grader, Western Colorado Regional Science Fair, Colorado Mesa University
2018

2015

Station Facilitator, Dragon Math Competition, South Island School, Hong Kong
2008

Volunteer, Math Extravaganza, Colorado Mesa University
2004

COURSES TAUGHT

COLORADO MESA UNIVERSITY

- MATC 090: Foundations of Math (Fall 2021)
- MATC 091: Intermediate Algebra (Spring 2018, Fall 2018, Spring 2019, Fall 2019, Spring 2020)
- MATH 110: Mathematical Investigations (Fall 2020, Spring 2021, Fall 2021)
- MATH 113: College Algebra (Spring 2018, Fall 2018, Spring 2019, Fall 2019, Spring 2020, Fall 2020, Spring 2021, Fall 2021)
- MATH 196: Topics: Supplemental Instruction for MATH 113 (Fall 2020)

STAT 215: Statistics for Social and Behavioral Sciences (Spring 2018, Fall 2018, Spring 2019, Fall 2019,

Spring 2020, Fall 2020, Spring 2021, Fall 2021)]

UNIVERSITY OF OREGON

- Math 111: College Algebra (Fall 2014, Winter 2015, Summer 2015, Fall 2016)
- Math 112: Elementary Functions (Spring 2015, Winter 2016, Spring 2016)

COURSES TAUGHT AS GRADUATE TEACHING ASSISTANT

- Math 243: Introduction to Probability and Statistics (Fall 2015, Spring 2017)

COURSES TAUGHT AS UNDERGRADUATE TEACHING ASSISTANT

- Math 105: University Math I (Fall 2013, Winter 2014)
- Math 107: University Math III (Spring 2014)

Full-time Faculty Vita

Name: Wayn K.Ward **Start Year:** 2009

Program: Mathematics

Department: Mathematics and Statistics

Faculty Rank: Instructor

Highest Degree

MS; University of Nevada, Las Vegas; Physics; 2007

Education

MS, Physics, University of Nevada, Las Vegas—2007

BS, Physics, Colorado Mesa University--2004

Teaching

MATH 091 Intermediate Algebra

MATH 110 College Mathematics

MATH 113 College Algebra

MATH 119 Precalculus

MATH 121 Calculus for Business

MATH 130 Trigonometry

MATH 141 Analytical Geometry

MATH 151 Calculus I

MATH 152 Calculus II

CSCI 130 Introduction to Engineering Computer Science

PHYS 100 Concepts of Physics

Scholarship and Creative Work

Conference Presentations

- "Metastable State Populations in Laser Induced Plasmas," V.H.S. Kwong, C. Kyriakides, W.K. Ward, NASA Laboratory Astrophysics Workshop, Las Vegas, Nevada, 2006.
- "The Physics of Comic Books," Wayn Ward, Western Regional Honors Conference, Missoula, Montana, 2004.

Professional Memberships

- Alpha Chi, Academic Honor Society -- 2004 - present
- Kappa Mu Epsilon, Mathematics Honor Society -- 2004 – present
- Sigma Pi Sigma, National Physics Honor Society -- 2004 - present

Service

2020-Present

- Developed material for restructured Math 110 courses 2018-2020

- Developed material for online Math 110 courses 2014

- Math 110 Book Committee Chair 2013

- Search Committee Member - Instructor of Mathematics

Honors and Awards

- Colorado Mesa University Exemplary Faculty Award, 2010.

<div align="center">Enzo Wendler</div>
<div align="center">ewendler@coloradomesa. edu</div>

OBJECTIVE	To continue learning and share my knowledge with others.	
EDUCATION	Doctor of Philosophy, Washington State University, Pullman Major: Mathematics GPA: 4.0	May 2020
	Master of Science, University of Saskatchewan, Saskatoon SK, Canada Major: Mathematics GPA: 4.0	September 2014
	Bachelor of Science, University of Alaska, Fairbanks 2012 Majors: Mathematics, Physics GPA: 3.51	May

EXPERIENCE   Instructor of Mathematics   August 2020 - Present
Colorado Mesa University, Grand Junctions, CO

- Teaching full time at the undergraduate level.

Teaching Assistant   August 2015 - May

2020

Washington State University, Pullman, WA

- Taught a range of classes including College Algebra, Business Math, Linear Algebra, and Discrete Structures. These classes ranged from class sizes of 12 to over 100 students and in terms ranging from 4 to 16 weeks.

Teaching Assistant   September 2012 - August 2014
University of Saskatchewan, Saskatoon, SK, Canada

- Led recitation classes for calculus students.
- Assisted in grading midterms and final exams.

Math Tutor   March 2009 - May

2012

University of Alaska, Fairbanks

- Tutored students in material ranging from pre-calculus to differential equations.

Research Assistant   June 2011 - August 2011

COMPUTER
SKILLS

- Developed and ran numerical simulations for the run up of a wave. Familiar with Matlab and Latex. I have used several other languages including Python (sage) and C++.

I have also used Crowdmark for several of the courses I have taught.

| TALKS AND CONFERENCES | Joint Math Meeting | January 2020 |
| | Denver, CO | |

- Gave a talk in the AMS Contributed Paper Session on Algebra and Algebraic Geometry.

| | Joint Math Meeting, | January 2019 |
| | Baltimore, MD | |

| | Western Canada Linear Algebra Meeting | May 2018 |
| | Pullman, WA | |

- Attended and gave a talk titled "α-adjacency: A generalization of adjacency matrices"

| | Graduate Workshop in Combinatorics | July 2017 |
| | Denver, CO | |

- Worked with other graduate students on open problems in combinatorics

| | Meeting of the International Linear Algebra Society | July 2017 |
| | Ames, IA | |

- Attended the conference and gave a talk titled "A generalization of skew adja- cency matrices and spectra"

| | AMS Spring Western Sectional Meeting | April 2017 |
| | Pullman, WA | |

- Attended the conference and gave a talk titled "α adjacency matrices"

PUBLICATIONS J.J. McDonald, R. Nandi, K.C. Sivakumar, P. Sushmitha, M.J. Tsatsomeros, E. Wendler, and M. Wendler. "M-matrix and inverse M-matrix extensions" Special Matrices, vol. 8, no. 1, 2020, pp. 186-203.

J.-C. Wang, E. Wendler. "Law of Large Numbers for Monotone Convolution". Probability and Mathematical Statistics, vol. 33, Fasc. 2, 2012, pp. 225-231.

M. Hudelson, J. McDonald, and E. Wendler. "Alpha Adjacency: A generalization of adjacency matrices", Electronic Journal of Linear Algebra, vol. 35, 2019, pp. 365-375.

| GRANTS | Travel Grant for JMM | |
| | 2020 | January |

- Received a grant from the graduate and professional student association to attend to Joint Math Meetings in Denver, Colorado.

| | Travel Grant for JMM | January |
| | 2019 | |

- Received a departmental travel grant to go the Joint Math Meetings in Balti- more.

MISCELLANEOUS

Megan Wendler
mwendler@coloradomesa.edu

EDUCATION

Washington State University, Pullman, WA

PhD in Mathematics   May 2020

PhD thesis: "Semimonotone Matrices"

University of Saskatchewan, Saskatoon, SK, Canada

Masters' of Science, Mathematics.   August 2014

Masters' thesis: "Convergence in the Mean-Field Limit for Two Species of Bosonic Particles"

University of Alaska, Fairbanks, AK

B.S., Mathematics, Physics   May 2012
Minor, Japanese

Graduated cum laude, University Honors
Scholar Honors thesis: "Chaos and Dynamical
Systems"

WORK EXERIENCE

Assistant Professor of Mathematics   August 2020 - present

Colorado Mesa University, Grand Junction, CO

Graduate Teaching Assistant   September 2015 - May 2020

Washington State University, Pullman, WA

- Primary instructor for courses including Intro to
  Mathematical Proofs, Linear Algebra, Calculus III, and
  Business Calculus
- Led review sessions for the doctoral Graduate Qualifying Exam
- Tutored students at the Math Learning Center

Graduate Student Assistant   September 2012 - September 2014

University of Saskatchewan, Saskatoon, SK Canada

- Led tutorials for calculus classes
- Assisted in grading exams and homework

Math Lab Tutor   September 2010 - May 2012

University of Alaska, Fairbanks, AK

- Tutored students at the calculus level and higher

Developmental Math Lab Tutor   September 2009 - May 2010

University of Alaska, Fairbanks, AK

- Tutored students in developmental math and precalculus

Biological Science Aid   April 2007 - August 2008

USDA-ARS (Agricultural Research Service), Fairbanks, AK

- Assisted with laboratory and field work relating to the study of insects in Alaska

CONFERENCES AND TALKS

- SIMIODE Expo 2021, virtual   February 12-13, 2021
- Joint Mathematics Meetings, Denver, CO   January 15-18, 2020
  Talk: The almost semimonotone matrices
- Joint Mathematics Meetings, Baltimore, MD   January 16-19, 2019
- Western Canada Linear Algebra Meeting, Pullman, WA   May 26-27, 2018
  Talk: Semimonotone matrices
- International Linear Algebra Society Conference, Ames, Iowa   July 24-28, 2017
- AMS Spring Western Sectional Meeting, Pullman, WA   April 22-23, 201

PUBLICATIONS

- K.C. Sivakumar, S. Parameswaran, and M. Wendler, Karamardian matrices: a generalization to Q-matrices, *Electronic Journal of Linear Algebra* **37** (2021), 127-155.
- J.J McDonald, R. Nandi, K.C. Sivakumar, P. Sushmitha, M.J. Tsatsomeros, E. Wendler, and M. Wendler, M- matrix and inverse M-matrix extensions, *Special Matrices* **8** (2020), 186-203.
- M. Wendler, The almost semimonotone matrices*, Special Matrices* **7** (2019), 291-303.
- M.J. Tsatsomeros and M. Wendler, Semimonotone matrices, *Linear Algebra Appl.* **578** (2019), 207-224.

PROFESSIONAL SERVICE

- Reviewer for Mathematical Reviews   March 2020
- Reviewer for Linear and Multilinear Algebra   October 2019
- Reviewer for The Electronic Journal of Linear Algebra   August 2018

GRANTS

- AMS Travel Grant to travel to the JMM in January 2020   fall 2019
- Travel Grant from Washington State University to attend the JMM   January 2019

AWARDS

- Sidney G. and Evelyn Hacker Graduate Teaching Fellowship   spring 2018
- Thomas Head Math Scholarship   fall 2011
- Alaska Scholar Award   fall 2006

SKILLS

- Proficient with Matlab, LaTeX, and HTML
- Some experience with other programming languages such as C++

INTERNATIONAL EXPERIENCE

Volunteer and Travel in South America   September 2014 - May 2016

Workaway

- Lived and worked with various families in South America while experiencing different ways of life and learning Spanish

Study Abroad in Japan   June - August 2010

Hokkaido International Foundation

- Experienced a homestay with a Japanese family which fully immersed myself in Japanese language and culture
- Attended intensive Japanese language classes

Semester Abroad in New Zealand   February - July 2009

AustraLearn

- Adapted to a new environment and embraced a new culture while taking university classes

MISCELLANEOUS

Project NExT   summer 2021 - 2022

- Accepted into the Project NExT program to start in the summer of 2021

Graduate Qualifying Exam Study Session Leader   spring 2018

Washington State University

Asked by the math department to lead a study group once a week for the graduate qualifying

APPENDIX D

Library Assessment Report

Date of Assessment: September 1, 2021

Program under review: Mathematics

Description of Program:
The Associate of Science (A.S.) degree with an emphasis in mathematics provides students with a reasonable exposure to foundational college-level mathematics. The A.S. is the appropriate choice for students who will take upper division coursework in mathematics, biological sciences, and physical sciences.

The Bachelors' of Science (B.S.) degree in Mathematics provides students with the knowledge and skills to pursue careers in business or science or to further their education by attending graduate school (in mathematics, computer science, and engineering), law school, medical school, or veterinary school.

Program Level/s: Associate of Science (A.S.) degree, Bachelors' of Science (B.S.) degree

Liaison: Anne Bledsoe

1. Collection Assessment

    The assessment covers five areas: Reference sources, Monographs, Electronic resources, Periodicals and Media. The assessment methodology, supporting data and resource lists are included in the Appendices.

    Appendix A: Reference Sources   p. 3   Appendix D: Periodicals   p. 6
    Appendix B: Monographs   p. 3   Appendix E: Media   p. 7
    Appendix C: Electronic Resources   p. 4   Appendix F: Additional Resources p. 8

Collection development is the joint responsibility of the Mathematics faculty and the Mathematics department liaison librarian. Review slips and new title lists are sent to the faculty regularly for their review.   Faculty may also recommend titles found in their journal reading or publishers' advertisements. Titles recommended are sent to the librarian who reviews them and sends them on for purchase as funds allow; 72 titles were purchased from the department materials budget in the last 5 years.

The budget line is supplemented by the SpringerLink, Elsevier, and Oxford E-book subscriptions.

2. Evaluation of the total collection

The indexing and full text provided by the MathSciNet, JSTOR, and Science Direct databases allow access to much of the current scholarship in the field and strengthen the Library's support of Mathematics research. Support for the Math Education concentration is provided likewise by the Education Full Text and ERIC databases, and support for the Actuarial Science concentration is supplemented by the Business Source Complete database. While not extensive, the Library's reference and circulating collections sufficiently support coursework for undergraduate Math majors. The library's print Mathematics collection is significantly bolstered by the content and currency of the Springer and Oxford ebook collections.

Several topic areas of the book and ebook collections were found to be notably weak in coverage and currency, including ethnomathematics, business mathematics, and actuarial science.

3. Recommendations

The acquisition of current materials in the field should continue, particularly in areas of program concentration, and the scope of electronic resources should be maintained. Particular effort should be made to build the collection in support of the Actuarial Science concentration. Existing funds should be adequate to purchase new materials.

Mathematics faculty are impressively active and thoughtful in the selection of library materials in support of coursework in the program. I am confident that this will continue and that selections will reflect the needs of student and faculty researchers.

Library Director:

Sylvia L. Rael

Date: September 3,2021

APPENDIX A: Reference sources

Tomlinson Library provides ample reference material in the field of Mathematics, both in the print Reference collection and online. Some selected reference sources:

Encyclopedia of Mathematics (available online through Springer Publishing)
Peterson's Graduate Programs in the Physical Sciences, Mathematics, Agricultural Sciences, the Environment, and Natural Resources (2020)
101 Careers in Mathematics (2019)
Exercises in (Mathematical) Style: Stories of Binomial Coefficients (2017)
Concise Oxford Dictionary of Mathematics (2014), available online through Oxford Reference
Encyclopedia of Mathematics and Society (2012)
Business Ratios and Formulas: A Comprehensive Guide (2012)
Universal Book of Mathematics: From Abracadabra to Zeno's Paradoxes (2004)
Encyclopedia of Mathematics Education (2001)
CRC Concise Encyclopedia of Mathematics (1999)
Companion Encyclopedia of the History and Philosophy of the Mathematical Sciences (1994)
CRC Standard Mathematical Tables and Formulae (1991)

APPENDIX B: Monographs
    <u>Method of analysis</u>

The Tomlinson Library Online Catalog was searched for books and ebooks. Searches were done for all print monographic materials and then limited to those published since 2010. A subject keyword search of the online catalog using the term "mathematics" resulted in over 8,000 items. More specific searches using Library of Congress Subject Headings are presented here:

Subject Heading	CMU All Print	CMU 2010-Print	CMU E-Books
Mathematics	2,738	212	11,421
Statistics	720	79	5,307
Algebra	414	13	984
Calculus	118	3	317
Trigonometry	35	1	12
Business Mathematics	25	2	156
Actuarial Science	0	0	15
Differential Equations	76	4	1,067
Number Theory	88	4	194
Ethnomathematics	2	1	6
Numerical Analysis	41	1	322

Fourier Analysis	16	1	77
Mathematical Models	262	29	3,724
Mathematics - History	98	13	178
Geometry	272	8	749
Topology	100	3	290
Logic, Symbolic and Mathematical	80	6	345
Functions of Complex Variables	26	0	94
Mathematical Analysis	121	11	994

The Library book collection has a good selection of resources across most of the subject areas listed above although several areas lack recent materials. A few topic areas are notably weak, such as ethnomathematics, trigonometry, business mathematics and actuarial science.

APPENDIX C: Electronic Resources

Indexes/Databases

Indexing and full text access to the journal literature in the field of Mathematics is provided through several databases. Foremost would be the MathSciNet, providing indexing, abstracts, and often linking to full text for articles and books back to the early 1800s. Additional indexing, much with full text, can be found in the Academic Search Complete and Science Direct databases. The library's JSTOR subscription also provides archival full text coverage and keyword indexing to 59 Mathematics journals. The Education Full Text and ERIC databases provide indexing and full text access for journals concerning the teaching of Mathematics, and The Business Source Complete database offers journal support for the Actuarial Science program concentration.

Journal Articles

To demonstrate journal article coverage across these resources, subject heading searches were performed in the MathSciNet, Academic Search Complete, Education Full Text, and Business Source Complete databases. JSTOR and Science Direct searches were not included as the content from these databases is indexed in MathSciNet. Searches in the EBSCO Discovery Service (EDS) "Search All" were also included to uncover resources across database platforms.

Subject Heading	MathSciNet	Academic Search Complete	Education Full Text	Business Source Complete	EDS

Mathematics	1,714,575	323,292	38,220	53,200	1,397,621
Statistics	323,081	613,008	50,620	200,102	4,418,025
Algebra	452,365	106,215	3,452	9,583	413,519
Calculus	57,829	31,703	2,194	3,463	155,977
Trigonometry	1,114	1,245	348	93	5,488
Business Mathematics	10,303	123	24	605	2,308
Actuarial Science	6,589	159	20	608	3,403
Differential Equations	305,092	120,073	671	9,631	644,326
Number Theory	164,124	15,723	620	1,631	107,410
Ethnomathematics	100	141	72	11	765
Numerical Analysis	926,243	135,092	360	18,142	526,009
Fourier Analysis	21,611	7,777	33	1,098	47,060
Mathematical Models	163,120	196,398	6,195	64,112	1,138,431
Mathematics - History	24,447	933	338	61	19,977
Geometry	169,639	78,955	3,757	9,754	402,226
Topology	111,134	43,855	183	6,342	205,010
Logic, Symbolic and Mathematical	28,462	24	43	7	758
Functions of Complex Variables	19,526	822	3	35	7,101
Mathematical Analysis	160,535	98,152	844	12,313	559,295

These search results suggest abundant material available in periodical resources, much with immediate full text. Journal literature not available in full text through Colorado Mesa University can be obtained by the Interlibrary Loan Department. Article requests submitted through Interlibrary Loan are usually filled within 24 hours; the average turn-around time is 12 hours.

APPENDIX D: Periodicals

With the exception of two mathematics education journals in the library print periodical collection (*Mathematics in School* and *Mathematics Teaching*), the library's journal subscriptions for Mathematics are online, through publisher subscriptions and the Wiley, Sage, Elsevier, and JSTOR

database subscription packages. Many journals for the Math program have current subscription access; some are accessible with an access embargo of 6 months-5 years.

Representative Online Journals: *current access

American Journal of Mathematics
*The American Mathematical Monthly**
*American Statistician**
Annals of Applied Statistics
Annals of Economics and Statistics
Annals of Mathematics
Applicable Analysis and Discrete Mathematics
*Applied Mathematics and Computation**
Applied Mathematics and Optimization
*Applied Mathematics Letters**
Bulletin of Symbolic Logic
*College Mathematics Journal**
*Communications on Pure and Applied Mathematics**
*Computational and Mathematical Methods**
Differential Equations
Educational Studies in Mathematics
Journal for Research in Mathematics Education
Journal for Commutative Algebra
Journal of Computational Mathematics
Journal of Integral Equations and Applications
Journal of Operator Theory
Journal of Symbolic Logic
Journal of the American Mathematical Society
*Mathematical Finance**
*Math Horizons**
*Mathematical and Computer Modelling of Dynamical Systems**
*Mathematical Biosciences**
*Mathematical Intelligencer**
*Mathematical Logic Quarterly**
*Mathematical Methods in the Applied Sciences**
*Mathematical Methods of Operations Research**
Mathematical Programming
*Mathematical Scientist**
*Mathematical Social Sciences**
*Mathematics and Computer Education**
*Mathematics and Mechanics of Solids**
Mathematics in School
Mathematics Magazine
Mathematics of Control, Signals, and Systems: MCSS
Mathematics of Computation
*Mathematics Teacher**
*Mathematics Teaching**

Natural Resource Modeling*
Numerical Methods for Partial Differential Equations*
Philosophical Transactions: Mathematical, Physical and Engineering Sciences
Proceedings of the American Mathematical Society
Quarterly of Applied Mathematics
Real Analysis Exchange
Rocky Mountain Journal of Mathematics
School Science and Mathematics*
SIAM Journal on Applied Mathematics
Studies in Applied Mathematics*
Transactions of the American Mathematical Society

APPENDIX E: Media

The streaming video collection Films on Demand includes documentaries and educational films concerning applied mathematics topics (110 titles) and mathematics and statistics topics (513 titles). A selection of titles from this collection:

> *Mathematics and Civilization*
> *Fractals: An Animated Discussion*
> *In Sync: Mathematics Illuminated*
> *Integral Calc: Calculus*
> *Poincare's Conjecture*
> *Topology's Twists and Turns: Mathematics Illuminated*
> *Knot Theory*
> *Fourier Analysis in Action*
> *Mapping the Future: The Power of Algorithms*
> *Binomial Probability Distribution*
> *Combinatorics Counts*
> *Mathematics and Nature*
> *Linear Functions: An Introduction*

APPENDIX F: Additional Resources

In collaboration with Math faculty, the library has created research guides for particular Math courses on the library website (MATH 110 – College Mathematics, MATH 301 – Mathematics for Elementary Teachers, and MATH 492 – Senior Capstone), providing links to resources and guidance for particular coursework.

The Library also offers research support through instructional sessions covering how to access and use research tools in the discipline, how to evaluate information and sources, how to use information ethically. A series of tutorial modules for using academic sources has also been developed by the library; this can be copied and adapted by instructors within the D2L course management system. Instructors can also add an "embedded librarian" to their D2L course shells for focused research help. Research support is also offered at the Research Help desk within Tomlinson Library and online through a 24 hour Ask a Librarian chat service.

APPENDIX E

Assessment

COLORADO MESA UNIVERSITY

Three-Year Assessment Summary Report

Program: Mathematics

Reporting Period: 2017/18

The Colorado Mesa University assessment summary report will consist of areas regarding program student learning outcomes, results, and actions taken over a 3-year period. Please attach the last three years of annual assessment reports, and any department/program minutes that recorded discussion of learning outcomes. Summarize each student learning outcome that has been assessed over the past three years.

Assessment Summary

Program Outcome 1	Courses/Educational Strategies Used (from Curriculum Map)	Assessment Method(s)	Semester of Data Collection
Students will construct multi-step problem-solving strategies, and communicate solutions effectively in written form. (Specialized Knowledge / Quantitative Fluency)	• MATH 253 Calculus 3 • MATH 325 Linear Algebra	Common questions on final exam, graded according to a common rubric.	Fall 2014 – Spring 2017

Results Summary

Year	Results (Include numbers of students)	Target or Benchmark (If Applicable)
2014-2017	Actual assessment data are lost due to the resignation of a faculty member. Results were satisfactory in MATH 253, but mixed in MATH 325.	

Actions Taken (Briefly describe the analysis of the results and actions taken for future assessment. Indicate any budget implications based on the analysis. Limit 150 words.)

Numerous discussions took place during meetings of the Math Program Working Group. Action taken: Split the 3-credit course Linear Algebra ("old" MATH 325) into two consecutive courses: the newly designed 2-credit Computational Linear Algebra (MATH 225), followed by the 3-credit Linear Algebra ("new" MATH 325).

Program Outcome 2	Courses/Educational Strategies Used (from Curriculum Map)	Assessment Method(s)	Semester of Data Collection
Students will use mathematical software (including calculators) to aid in problem-solving and investigation, and understand its limitations. (Applied Learning)	• MATH 253 Calculus 3 • MATH 325 Linear Algebra	Common questions on final exam, graded according to a common rubric.	Fall 2014 – Spring 2017

Results Summary

Year	Results (Include numbers of students)	Target or Benchmark (If Applicable)
2014-2017	Actual assessment data are lost due to the resignation of a faculty member. Results were satisfactory for both courses, but better in MATH 253.	

Actions Taken

Restructuring of the Linear Algebra course sequence (see above), and the addition of an Applied Mathematics concentration (see below) to strengthen the Applied Learning component of our program.

Program Outcome 3	Courses/Educational Strategies Used (from Curriculum Map)	Assessment Method(s)	Semester of Data Collection
Students will prove propositions deductively from definitions and theorems, using clear and precise prose. (Critical Thinking)	• MATH 240 Introduction to Advanced Mathematics • MATH 452 Real Analysis 1 • MATH 490 Abstract Algebra 1	Homework portfolios were collected and graded according to a common rubric.	Fall 2014 – Spring 2017

Results Summary

Year	Results (Include numbers of students)	Target or Benchmark (If Applicable)
2014-2017	Actual assessment data are lost due to the resignation of a faculty member. Faculty felt that the data showed that there is some misconception about the nature of mathematics among incoming students, and that some students might be better served with a more applied curriculum.	

Actions Taken

1. **Introduced a mandatory 1-credit "freshman seminar" course called Topics and Careers in Mathematics (MATH 150).**
2. Added an Applied Mathematics Concentration to our degree offerings.

Program Outcome 4	Courses/Education al Strategies Used (from Curriculum Map)	Assessment Method(s)	Semester of Data Collection
Students will learn an area of mathematics deeply and deliver substantial written and oral presentations of this area. (Specialized Knowledge / Communication Fluency)	MATH 494 Senior Seminar 2	Each mathematics major conducts guided research culminating in a thesis and oral presentation, which are assessed according to a common rubric.	Spring 2015 – Fall 2017

Results Summary

Year	Results (Include numbers of students)	Target or Benchmark (If Applicable)
2015-2017	All 34 students who were assessed met the expectations set in the benchmark.	Get a combined score of 30 points (out of 50 points) on the rubrics for written and oral presentations of specialized knowledge.

Actions Taken:

None.

Ethics Assessment Results

1. Pick a person in the USA at random. Let MARI be the event that the person has used marijuana, and let METH be the event that the person has used methamphetamine. A politician wants to argue that marijuana should be illegal because it is a gateway drug to methamphetamine. Which of the following sets of probabilities can be used to make a reasonable, ethical argument for banning recreational marijuana on the grounds that its use leads to the use of methamphetamine?

    A)   P(MARI and METH)

    B)   P(MARI|METH), P(MARI)

    C)   P(MARI or METH)

    D)   P(METH|MARI), P(METH)

    E)   P(MARI) alone

    F)   P(METH) alone

2. A pharmaceutical company wants to test a new medication for reducing blood pressure. To do this, the company's researchers conduct a hypothesis test at the 5% significance level. The null hypothesis H_0 will be that the treatment does not work, so that a successful rejection of H_0 means that the treatment works. If the p-value is 0.08, which statement by the company is appropriate?

    A)   There is no evidence that the treatment works.

    B)   There is some evidence that the treatment works, but it is not extremely strong.

    C)   There is strong evidence that the treatment works.

    D)   There is evidence that the treatment does not work.

Fall 2018 Results:

Question 1: 60 %

correct Question2: 42

% correct

Senior Capstone Paper Rubric (Mentor Version)

Project Purpose: Research/learn/study a topic of your choosing that is closely tied to your mathematics concentration area.

The final project is worth 40% of the final course grade. This paper is worth 40 out of 100 possible project points. The bullet points below each grading area offer guidance to the student and the grader. They are not intended to be exclusive.

_____**Content (18 points)**

- ❒ Consists of senior-level content that is based on the approved project proposal and directly related to your concentration.
- ❒ A strong understanding of your content (mathematics, statistics, math education) must be demonstrated.
- ❒ Discussion of content is complete (for a project at this level), accurate, and precise.
- ❒ Content is written for appropriate audience: someone with a mathematics major (any concentration) who has taken at least one course in your area should be able to follow most of your paper.

_____**Writing Style (9 points)**

- ❒ Content is logically organized and focused. Extraneous details are not included.
- ❒ Grammar, spelling, and use of language are correct.
- ❒ Technical writing (correct and appropriate use of mathematical language).
- ❒ Nature of writing is appropriate for a senior level paper.

_____**Adjustments Based on Draft Comments (5 points)**

- ❒ Appropriate improvements were made based on draft paper comments

_____**Bibliography and Citations* (5 points)**

- ❒ Bibliography and citations are complete and correct.
- ❒ Contains appropriate number of sources (approximately 5-7).
- ❒ At least three sources are refereed/peer-reviewed.

_____**Technical Components (3 points)**

- ❒ Typesetting, length, margins (1-1.5"), font size (11/12pt), etc. adhere to stated requirements
  One goal of this project is for you to identify what is most important to include and write a paper of appropriate length. Most papers should be about 5-10 pages long.

- ❒ Title page: Name, Title of project, Date, Abstract
- ❒ Appropriate Sections (numbered) including:
  - ▪ Introduction; Main Sections (this is where the majority of your work will go); Conclusion; Bibliography

Senior Capstone Paper Rubric (Additional Reader Version)

Project Purpose: Research/learn/study a topic of your choosing that is closely tied to your mathematics concentration area.

The final project is worth 40% of the final course grade. This paper is worth 40 out of 100 possible project points. The bullet points below each grading area offer guidance to the student and the grader. They are not intended to be exclusive.

_____**Content (21 points)**

- ❐ Consists of senior-level content that is based on the approved project proposal and directly related to your concentration.
- ❐ A strong understanding of your content (mathematics, statistics, math education) must be demonstrated.
- ❐ Discussion of content is complete (for a project at this level), accurate, and precise.
- ❐ Content is written for appropriate audience: someone with a mathematics major (any concentration) who has taken at least one course in your area should be able to follow most of your paper.

_____**Writing Style (11 points)**

- ❐ Content is logically organized and focused. Extraneous details are not included.
- ❐ Grammar, spelling, and use of language are correct.
- ❐ Technical writing (correct and appropriate use of mathematical language).
- ❐ Nature of writing is appropriate for a senior level paper.

_____**Bibliography and Citations* (5 points)**

- ❐ Bibliography and citations are complete and correct.
- ❐ Contains appropriate number of sources (approximately 5-7).
- ❐ At least three sources are refereed/peer-reviewed.

_____**Technical Components (3 point)**

- ❐ Typesetting, length, margins (1-1.5"), font size (11/12pt), etc. adhere to stated requirements
    One goal of this project is for you to identify what is most important to include and write a paper of appropriate length. Most papers should be about 5-10 pages long.

- ❒ Title page: Name, Title of project, Date, Abstract
- ❒ Appropriate Sections (numbered) including:
  - ▪ Introduction; Main Sections (this is where the majority of your work will go); Conclusion; Bibliography

*Note: If the bibliography and/or citations are incomplete to the extent that plagiarism is identified, the student will receive a zero on the paper and possibly in the course.

Senior Capstone Presentation Rubric

Project Purpose: Research/learn/study a topic of your choosing that is closely tied to your mathematics concentration area.

This final project is worth 40% of your final course grade. The presentation is worth 35 out of 100 possible project points. The bullet points next to each grading area offer guidance to the student and the grader. They are not intended to be exclusive.

Presentation Skills (6 pts)

- ❒ Order and style of presentation makes sense.
- ❒ Explanations are clear; talk is practiced.
- ❒ Speaker is professional (including appropriate attire—business casual)
- ❒ Appropriate amount of material presented for time allotted.
- ❒ Mechanics: volume, articulation, addressing audience, **meets time requirements** (5-7 min), etc).

Poster Style

/Organization

(5 pts)

Presentation *content*

is assessed below

- ❒ Poster is be well-organized
  - o Contains appropriate amount of content (gives good sense of the project but is not over-crowded).
  - o Can follow the thread of the content easily across the poster.
  - o Must have an introduction (or abstract) and conclusion, though they may be titled differently.
- ❒ Poster is aesthetically pleasing: avoids clashing colors, randomly changing fonts/font sizes, cluttered appearance, etc.
- ❒ Includes appropriate references and citations
  - o Be sure to cite images, graphs, etc. that are not your own.

Content (21 pts)

- ❑ Presentation reflects a strong understanding of the project content.
- ❑ Verbal explanations are correct, well-organized, and clear.
- ❑ Presentation is at an appropriate level for a mathematics major (any concentration) who has taken at least one course in your area to follow most of your talk.
- ❑ Poster content reflects a strong understanding of the project content.
- ❑ Technical writing and explanations on the poster are correct, well-organized, and clear.
- ❑ Writing on the poster is senior level (correct grammar, spelling, etc.).

Question/Answer Follow-up

(3 pts)

- ❑ Speaker is generally comfortable with the content he/she presented.
- ❑ Responses to questions/ requests for clarification are correct and adequate.

Rubrics for Senior Seminar Prior to 2019

The rubric for final papers was based on a 30-point scale.

Mathematical Content (up to 12 points)

- · Mathematics is accurate and precise
- · Mathematics is written for appropriate audience (senior mathematics major who has taken one course in your general area, i.e.: analysis, not wavelet analysis; number theory, not cryptography)
- · Paper demonstrates a deep understanding of the researched topic with appropriate explanations
- · The level of mathematical research is appropriate for a capstone experience

Writing Style (up to 9 points)

- · Content is logically organized
- · Correct grammar, spelling and use of language
- · Technical writing (correct and appropriate use of mathematical language)

Abstract, Bibliography and Citations (up to 6 points)

- · Abstract is succinct and accurately reflects content of paper
- · Bibliography and citations are complete and correct
- · Contains appropriate number of sources

The rubric for final presentations was based on a 20-point scale.

Presentation (up to 6 points)

· Order and style of presentation makes sense
· Explanations are clear; talk is practiced
· Material is well-motivated
· Appropriate amount of material presented for time allotted
· Speaker is professional
· Mechanics: slides/computer projection, volume, articulation, legibility, addressing audience, meets time requirements, etc)

Mathematical Content (up to 10 points)

· Mathematics is accurate and precise (on slides and in oral presentation)
· Appropriate terminology and notation is utilized (on slides and in oral presentation)
· Mathematics is presented for appropriate audience (senior mathematics major who has taken one course in your general area, i.e.: analysis, not wavelet analysis; number theory, not cryptography)
· Presentation demonstrates a deep understanding of the researched topic with appropriate explanations
· The level of mathematical research is appropriate for a capstone experience

Comfort with material (up to 4 points)

· Speaker is generally comfortable with the mathematics being presented
· Responses to questions/ requests for clarification are correct and adequate

Alumni Survey Results of Mathematics Graduates

36 responses, 83 in population, response rate - 43.4%

Overall, how satisfied are you with your undergraduate education?

	#	%
Very Satisfied	2	61.1
Generally Satisfied	1	30.6
Ambivalent	3	8.3%
Generally Dissatisfied	0	0.0%
Very Dissatisfied	0	0.0%

While an undergraduate, about how often did you have conversations with faculty outside of class?

	#	%
Never	0	0.0%
Rarely (1-2 times per semester)	2	5.6%
Occasionally (3-5 times per	5	13.9%
Often (once every two weeks)	10	27.8%
Very Often (at least once a week)	19	52.8%

Would you encourage a current high school senior to attend CMU?

	#	%
Definitely Would	2	61.1%
Probably Would	7	19.4%
Maybe	6	16.7%
Probably Would Not	1	2.8%
Definitely Would Not	0	0.0%

What degree(s) did you receive in Mathematics?

	#	%
A.S. Mathematics	8	21.1%
B.A. Elementary Education Math	0	0.0%
B.S. Mathematics	1	34.2%
B.S. Mathematics - Secondary Ed.	4	10.5%
B.S. Mathematics - Statistics	1	34.2%

In what year did you graduate from the major/certificate you chose above?

	#	%
2020	6	16.7%
2019	10	27.8%
2018	4	11.1%
2017	4	11.1%
2016	4	11.1%
2015	1	2.8%
2014	5	13.9%
2013	2	5.6%
Other	0	0.0%

How would you rate the overall quality of your education within that degree/certificate program?

	#	%
Very High	20	55.6%
High	9	25.0%
Average	7	19.4%
Low	0	0.0%
Very Low	0	0.0%

Associate Student Learning

Based on what you know now, how well do you think your undergraduate experience prepared you to:

	Very Well		More than Adequately		Adequately		Less Than Adequately		Very Poorly	
	#	%	#	%	#	%	#	%	#	%
Locate, gather and organize evidence on an assigned topic addressing a course or discipline-related question or a question of practice in a work or community setting (Specialized Knowledge/Applied Learning)	5	62.5%	2	25.0%	1	12.5%	0	0.0%	0	0.0%
Use program-level mathematical concepts and methods to understand, analyze, and explain issues in quantitative terms (Intellectual Skills: Quantitative Fluency)	5	62.5%	1	12.5%	2	25.0%	0	0.0%	0	0.0%
Make and defend claims in a well-organized, professional document and/or oral presentation that is appropriate for a specific audience (Intellectual Skills: Communication Fluency)	6	75.0%	2	25.0%	0	0.0%	0	0.0%	0	0.0%
Identify and gather the information/data relevant to the essential question, issue and/or problem and develop informed conclusions (Intellectual Skills: Critical Thinking)	6	75.0%	2	25.0%	0	0.0%	0	0.0%	0	0.0%
Reflect on and respond to ethical, social, civic, and/or environmental challenges at local, national, and/or global levels (personal and social responsibility)	5	62.5%	1	12.5%	1	12.5%	1	12.5%	0	0.0%
Identify, utilize and cite various sources of information in academic assignments, projects or performances (information literacy)	6	75.0%	2	25.0%	0	0.0%	0	0.0%	0	0.0%

Baccalaureate Student Learning

Based on what you know now, how well do you think your undergraduate experience prepared you to:

	Very Well		More than Adequately		Adequately		Less Than Adequately		Very Poorly	
	#	%	#	%	#	%	#	%	#	%
Construct a summative project, paper or practiced-based performance that draws on current research, scholarship and/or techniques, and specialized knowledge in the discipline (Applied Learning/ Specialized Knowledge)	13	39.4%	11	33.3%	8	24.2%	1	3.0%	0	0.0%
Analyze data critically, reason logically, and apply quantitative analysis methods correctly to develop appropriate conclusions (Intellectual Skills: Quantitative Fluency)	14	42.4%	15	45.5%	3	9.1%	0	0.0%	1	3.0%
Make and defend assertions about a specialized topic in an extended well-organized document and an oral presentation that is appropriate to the discipline (Intellectual Skills: Communication Fluency)	13	39.4%	14	42.4%	4	12.1%	2	6.1%	0	0.0%
Describe reasoned conclusions that articulate the implications and consequences for a particular decision by synthesizing information and methodologies (critical thinking)	18	54.5%	11	33.3%	3	9.1%	1	3.0%	0	0.0%
Reflect on and respond to ethical, social, civic, and/or environmental challenges at local, national, and/or global levels (personal and social responsibility)	8	25.0%	10	31.3%	8	25.0%	5	15.6%	1	3.1%
Find relevant sources of information, evaluate information critically, and apply the information appropriately and effectively to specific purposes (information literacy)	12	36.4%	15	45.5%	5	15.2%	1	3.0%	0	0.0%

Job and Career Questions

Are you working for pay right now?

	#	%
Yes, full-time	29	80.6%
Yes, part-time	4	11.1%
No	3	8.3%

Only respondents who answered "Yes" they are working for pay right now answered the following questions.

In what type of organization is your principal employment? Mark the one best answer.

Self-employed in own business or professional non-group practice	2
Private for-profit corporation/company/group/group-practice	8
Higher education (public or private)	6
Elementary or secondary education (public or private)	7
International organization in the US	2
International organization outside of the US	0
US Military	0
Federal Government (except military)	2
State and local government, institution, or agency (except education)	0
Private non-profit organization (except education and international organizations)	0
Other	9

Other Responses: Financial Institution, Bartender, Graduate TA, Ministry work, Professional Gambler, Retail Sales

Which of the following best describes your current position?

	#	%
Entry Level	15	45.5%
Mid-Level	15	45.5%
Senior Level	2	6.1%
Executive Level (except for chief executive)	1	3.0%
Chief Executive (CEO, COO, CFO, GM or principal in a business of other organization)	0	0.0%

How many years have you been in your current job type?

	#	%
Less than 3 years	1	51.5
3-5 years	1	36.4
6-9 years	3	9.1%
10 or more years	1	3.0%

Is your current position related to your CMU field(s) of study?

	#	%
Yes, related to major(s)	21	63.6%
No, not related	12	36.4%

How well did CMU prepare you for your current career?

	#	%
Very Well	1	41.9%
More than Adequately	6	19.4%
Adequately	7	22.6%
Less Than Adequately	4	12.9%
Very Poorly	1	3.2%
NA	0	0.0%

Job and Career Questions

What is your approximate annual gross income (before taxes)?

	#	%
Under $20,000	0	0.0%
$20,000 - $29,999	2	7.7%
$30,000 - $39,999	2	7.7%
$40,000 - $49,999	5	19.2%
$50,000 - $59,999	5	19.2%
$60,000 - $74,999	5	19.2%
$75,000 - $99,999	4	15.4%
$100,000 - $149,999	2	7.7%
$150,000 - $249,999	1	3.8%
$250,000 - $499,999	0	0.0%
Over $500,000	0	0.0%

Comments about your work experience that will help improve CMU:

- More presentations. Teaching was hard because I was not comfortable presenting.
  Don't fail people for classes because of low attendance. Students should be able to pass if they can teach themselves

- I work with faculty in my current position. Interacting with faculty as a student was an easy transfer to interact with them as colleagues. I have used some programming skills that I learned in my undergrad. I wish I learned more about

  Math/Stats students should be encouraged to pursue internships in the field of math, statistics, or information technology. I think that if the program were to implement some sort of structure or methodology to help students acquire these opportunities, job placement rates and salaries for new grads would see a significant increase.

  I would encourage your Statistics instructors to look into what the "best practices" are for teaching introductory and intermediate statistics courses. The courses I took as a major did not include any simulation based methods, which are the current standard for what ought to be taught in these courses. I would also encourage the use of technology beyond a TI calculator!

- There are a ton of jobs in coding right now. I think that CMU should focus on teaching all STEM majors to learn more about Object Oriented Programming Languages because it is likely that the STEM students will end up coding for their job rather than directly using the math concepts that they learn. I looked for a job in stats for 9 months before deciding to become a Software Engineer, and I know that I am not alone in struggling to find a job in my field of study before going into coding.

- Stay open for in class education some of us suck at internet learning
  Take as many stem courses outside of your major as possible. The more well rounded you are the better prepared you be in a professional working environment. Anyone can be an expert in their field but the ability to have conversations

Only respondents who answered "No" they are not working for pay right now answered the following question:

Why are you not currently working for pay? (Please mark all that apply)

	# of times checked
I chose not to enter the workforce at this time.	1
It has been difficult to find a position in my field.	1
It has been difficult to find a position paying an appropriate salary.	1
I am raising a family.	0
I am currently a student.	0
I am doing volunteer work.	0
I am retired.	0
Other	1

Other: I have chronic health issues that prevent me from working.

If you have comments about previous employment, work experience, or job hunting that will help improve CMU, please leave them here:
- There are broad applications for a math degree. Assistance in narrowing that search would be helpful.

Education since College

Have you enrolled in a graduate, professional, or other degree/certificate program since graduating from CMU?

	#	%
Yes	14	40.0%
No	16	45.7%
No, but I plan to enroll in the next two years.	5	14.3%

Only respondents who answered "Yes" I have enrolled in another degree/certificate program since graduating from CMU answered the following questions.

Are you enrolled in this program now?

	#	%
Yes, I am a full-time student	2	14.3%
Yes, I am a part-time student	3	21.4%
No	9	64.3%

How long after you graduated from the degree/certificate program this survey pertains to did you start this program?

	#	%
Immediately (following fall or spring)	4	28.6%
1 Year later	5	35.7%
2-3 years later	4	28.6%
4-6 years later	1	7.1%
NA	0	0.0%

Altogether, how many years have/did you attend(ed) further schooling? Mark the best answer.

	#	%
None	1	7.1%
1 - 2 years	1	71.4%
3 - 4 years	1	7.1%
5 - 6 years	2	14.3%
NA	0	0.0%

How well did CMU prepare you for this educational program?

	#	%
Very Well	4	28.6%
More than Adequately	5	35.7%
Adequately	3	21.4%
Less Than Adequately	2	14.3%
Very Poorly	0	0.0%
NA	0	0.0%

What level of education are/were you pursing?

	#	%
Certificate	1	6.7%
Associate	0	0.0%
Baccalaureate	1	6.7%
Post-Bacc Certificate	0	0.0%
Master's	11	73.3%
J.D.	0	0.0%
Doctoral	2	13.3%
Other	0	0.0%

Other:

In which field and program are/were you studying and what is the name of the College/University you attend(ed)?

College/University	Field Studying	Level Pursing
- Youngstown State University	Mathematics	Master's
- WGU	Computer	Baccalaur
- University of Wyoming	Science	eate
- University of Colorado Denver, Anchutz	Accounting	Master's
	Biostatistics	Master's
- University of Colorado Colorado Springs	Mathematics	Master's
- Rutgers University	MBS Biostatistics and Business Statistics	Master's
- Montana State University		Doctoral
- Masters- Louisiana State University	Masters- Education, Certificate- Math Education	Other
- Grand Canyon University		Master's
- Colorado Mesa University (bachelors),	Data	Master's
	Science	Master's
- Colorado Mesa University	Education	Master's
- Colorado Mesa University		Master's
- CMU	Masters in Education	Doctoral
- Baylor	Education	
	Statistics	

Did you complete this program?

	#	%
Yes	8	57.1%
No	1	7.1%
In the process of finishing	5	35.7%

Other comments about furthering your education:

- I completed my masters in December 2020 and am currently enrolled in the graduate certificate. Upon furthering my degree, I have presented in the National Virtual 2020 Joint Statistical Meetings and hoping to attend some more and network with people in this field in the future! I love where I'm working right now in ministry of a welcome center, and there are plenty of growth opportunities here that lead into my field or later down the road my dream job is pursuing data analytics at the Kennedy Space Center, and even further down the road teaching
- Mathematics and Statistics at the High school or Collegiate level!

Suggestions for improving the degree/certificate program:

I like how my graduate program blends together the business and analytical/science schools. At CMU I sometimes felt restricted to the

math/stat department. Might be worth seeing if the programs could be blended with other

- schools/departments
  I like the in person aspect of the graduate certificate, but as a coach, it is sometimes difficult to do the in person classes.

- But, all of the professors so far have worked with me and my coaching schedule.
- More emphasis on additional statistical coding languages in addition to R, which I learned a lot!

Additional Comments:

I would have benefited from having more math-based career fairs to see what I could do with my degree outside of

- teaching and research. Maybe a mentorship program where local employers look for interns with a math background to The ability to access instructors was one of the main reasons I chose to go with the program at CMU. Unfortunately after the pandemic began, access was limited. Being able to access an instructor online is not the same as being able to meet with them in person. It really changed the quality of my experience in a negative way. There were times when my internet connection was so bad I couldn't see or hear anything the instructor was saying in our online meetings. I think all courses should have at least some in person meetings, it would make a big difference.

Demographic Questions

What is your gender?

	#	%
Male	18	51.4%
Female	15	42.9%
Prefer not to respond	2	5.7%

What is your ethnicity?

	#	%
American Indian or Alaskan Native	0	0.0%
Asian	1	2.9%
Black or African American	0	0.0%
Hispanic of any race	3	8.6%
Native Hawaiian or Pacific Islander	0	0.0%
White	26	74.3%
Two or more races	1	2.9%
Race and ethnicity unknown	0	0.0%
Non-Resident Alien (of any race or ethnicity)	0	0.0%
Prefer not to respond	3	8.6%
Other	1	2.9%

What is your current age?

	#	%
Under 21	0	0.0%
21-24	8	22.9%
25-34	20	57.1%
35-44	6	17.1%
45-54	0	0.0%
55 or older	0	0.0%

	#	%
Prefer not to respond	1	2.9%

Do you live in the state of Colorado?

	#	%
Yes	26	74.3%
No	9	25.7%

If yes, do you live in Western Colorado?

	#	%
Yes	17	65.4%
No	9	34.6%

Describe what you think are the main strengths of the math/stat program at CMU

- The professors are amazing! I always knew that they cared about my success and they were very knowledgeable, approachable, and resourceful.
- Small classes
- Small class sizes that allowed the teachers to know you personally.
- Supportive and very knowledgeable professors that really challenge you to do your best.
- The main strengths are the professors. The time they took to get to know me outside of class really means a lot.
- Small class sizes, encouraging and patient professors, classes that prepared me for grad school
- The thing that stood out to me as a student was the small class sizes and that professors genuinely care about you as a student and a person. The professors are very knowledgeable.
- Accessibility to staff members outside of class and other self-help resources were a great strength of the program.
- Requiring students to take a computer programming course
- Class size is definitely a strength when you start taking junior/senior classes. The faculty availability is also a strength. I was able to get in touch with any of my professors by stopping in to chat or emailing them. The faculty really care.
- The majority of teachers have a strong desire to see their students succeed.
- Good faculty and range of class offerings
- There are many opportunities to get involved in math events such as math extravaganza and also the research opportunity doors are open wide with the capstone project!
- Curriculum is very strong and there is a good level of knowledge expected in this program.
- a large student to teacher ratio, the professors focus on math in class, the professors are approachable and available for questions, they challenge their students
- My core instructors knew what they were teaching.
- The professors, especially Kavanagh and Reitenbach.
- lots of involvement in R. getting to explore data.
- Knowledgeable faculty, available faculty (profs had time to meet if needed), passionate (about their field) faculty
- A well-rounded program with exceptional professors
- Small classes and wonderful, helpful professors
- The professors. They are engaging and driven to provide the best education for the students. They are always willing to help and provide fountains of knowledge.
- Supportive faculty and small program size
- Excellent faculty, integration of basic programming skills through Intro to Computer Science requirement and classes focused on using R
- I think the math/stat program offered a good balance of strict mathematics, theory and then more practical applications with the statistics course, design of experiments, etc. The accessibility of professors also meant a lot to me and kept me on track
- The small class sizes and extremely supportive faculty

-Student to faculty ratio - especially in upper division classes

-The professors office hours. The professors at CMU truly care and want you to

What changes do you think would strengthen the math/stat program at CMU?

-Don't only offer early morning classes.

-None

-I think it is pretty strong already. Maybe adding cross-course projects or community projects will create a stronger impact.

-More projects where the students must explore material, ask questions, and give a solution(s). More professors being encouraging of students studying concepts outside of class material.

-Number Theory and a higher stats course than STATS200 should be required for secondary math education majors.

-Courses focused on data and application focused statistical techniques rather than solely a mathematical focus. Make sure students know **why** you perform different statistical models, **why** you transform variables, what the conditions of models are. I would also recommend extensive experiences working with data in a reproducible language (e.g., R, SAS), throughout the curriculum.

-Offering mandatory classes at least once a year would strengthen the program as well as more hands-on advisors. My experience with my advisor differed from others. I had two advisors during my time at CMU and both were very hands off. I had to figure out what I needed to graduate but it would have been nice to have the guidance and a faculty member to discuss any issues/concerns you may have with the program.

-There are little to no opportunities for students to gain experience outside the classroom. It would require some creativity on your guys' part but perhaps a partnership program could be created between science departments or even the business department so that students can apply their knowledge and be able to put more than attending/speaking at seminars on their resumes/CVs.

-A master's degree offering

-As I look to pursue my master's degree in a similar but slight variation of statistics (in data science!) I know going in there is a lot more Python coding language than R. I would have loved more programming experiences in using Python, but also some other statistical languages such as SPSS or SAS.

-Having classes offered more often for those who need it. I.e. linear algebra is only offered every other semester. Other stats professors to teach upper levels, they're styles and expectations are so different, students aren't all receiving similar experiences for the same class.

-make sure that the focus continues to be on math rather than non-mathematical topics such as politics and Critical Race Theory

-Having advisors do more to assist upcoming graduates with obtaining employment in the student's field after graduation.

-Hire more faculty that the students see as role models.

-learning to use python

-More in-depth programming skills should be taught. While it is imperative to understand

the statistics going on in the background of these programs a deeper understanding of many of most popular statical software packages would be highly beneficial. I love R and enjoy using it but have found that it is rarely used in the real world. Introduction and instruction for some of these (spss, sas, Excel etc.) would be highly desirable for future students. Also, a general understanding of working with very very large data sets using these programs

i.e. calling on certain variables from the secure server where each variable in the data set has 10,000 observations

-I think having the professors teach the classes where they have the most expertise. You can tell they enjoy teaching that subject and thus provides a better Internship requirement or partnerships with employers

-A machine learning course would be excellent and applicable since it has roots in math and statistics.

-I think having more course options/professional paths with statistics would be helpful (ex. financial mathematics, actuarial science, biostatistics).

-Being able to offer classes more often

-Restructure the Math Stats classes. Almost everyone I knew in the stats program had no interest or understanding of actuarial sciences, and I think that is because the concepts in Math Stats 1 and 2 are not communicated very well. I would doubt that there is a single person who went to CMU then passed the P- exam.

-The difference in teachers at CMU is crazy. You would go from one teacher who actually cared, to a teacher who gave you a grade based on he felt, to a teacher who didn't have many standards. I think CMU really needs to reevaluate some of Truthfully a more rigorous course load. I am working towards my PhD and was not as prepared as some of

What was the most helpful math/stat course that you took at CMU, and in what way was it helpful?

-The most helpful course I took was history of math. I say this because I am a math teacher and I regularly draw upon that course to share some history with my students.

-Excel and spss classes

-MATH 240: introduction to advanced mathematics. This class helped me see proofs and reasons behind why math worked. I also enjoyed the history of mathematics course.

-I took Real Analysis I and II and those courses really challenged me more than any other course so I got to know myself more as a student and as a learner which has positively influence my career as a math teacher.

-I loved MATH 240 Introduction to Advanced Mathematics. It really changed how I thought about math and how I viewed logic in general.

-Math Modeling. Math Modeling taught me how to process information and to apply my mathematical knowledge, which then allowed me to know the math theory on a deeper level.

-The most helpful math class that I took was probably intro to advanced math. This class really helped me develop my math skills and thinking. It has also helped me better

answer high school students' questions about specific concepts.

-Linear Algebra was the most helpful for me. I find that many topics of Linear Algebra come up in the high school mathematics curriculum I teach.

-Introduction to Proof -- this class taught me how to struggle with mathematics and to not attach my own personal worth to how quickly I can solve a problem

-Senior Seminar. It made me realize research was not in my future.

-Senior Seminar II

-Mathematical statistics, because I became an actuary and the material was immediately relevant for my first exam and in daily work at my job

-Categorical Data Analysis was my favorite statistics course at CMU and it introduced me to using the R programming language. Additionally, the course on Time Series started my research project on the Colorado Rockies home run hitting averages which was very cool!

-Stat 200. Once i learned and understood the material I realized how applicable it is to many parts of life. I think critically about most things and that class has really impacted how I interpret things I see in everyday life

-probably Senior Capstone because I learned how to write a resume and a cover letter

-Statistical Methods. It gave great info for how statistics work is actually done.

-Number theory, because it helped with my graduate classes.

-correlation and regression. a lot of people like to use regression models in the professional world and its helpful to know the ins and outs of them.

-MLR (ott) and survey methodology

-Fourier Analysis directly applied to my current job

-Stat 425. This class was my favorite and it exposed me to a wide variety of modeling structures I would've never had the exposure to. Also great problem-solving techniques and fully understanding data analysis and requirements that must be met.

-Intro to advanced math, prepared for advanced courses as they are different from computational classes

-Senior Seminar classes were great because some employers ask about projects. It's hard to describe just one or two classes as the most helpful, though—all of the classes I took contributed to developing problem- solving skills that were necessary to begin and grow in my

-The regression analysis and real analysis courses were the most helpful to me looking back. I use regression analysis in my current position on a routine basis and real analysis drilled me on constructing logical arguments/proofs which I continue to use in my writing even though if I am not proving calculus

-Intro to Advanced because it taught me how to think about things differently and how to really explain myself concisely & precisely.

-Senior seminar- I worked very closely with Dr. Friedman and Dr. King. They are both extremely intellegent, and being able to work closely with them taught me how to think any with Dr. King

-The most helpful course for me was Time Series as it has inspired me to continue my research in that area.

Any additional comments you would like to make about the math/stat program at CMU?

-We need to be able to connect our math students with private sector jobs or connect them with grad schools.

-The program needs to spend more time teaching coding. I didn't learn python and had a minimal understanding of R. Both are very important in order to get a job.

-The professors went above and beyond to help me when I was struggaling with my health.

-The math department is a strong one and I would like to see more people taking advantage of it, so I would recommend that you advertise it more.

-Professors need to be consistent with their teaching/grading. The professor you take a class with shouldn't impact the amount you learn or the grade you get. I had experiences where I didn't feel like my understanding of a classes subject matter differed greatly from other students based on the teacher we had. Also, there should be more than two stats professors to teach upper levels. They are so inconsistent with how they teach, your grade really depends on who is teaching the class.

-My overall experience was quite positive. The faculty members truly care. They are accessible when you need them. Most of them will work with you when you're stuck on a topic or concept.

-it would be helpful to tell stats students that it is likely they will need either a graduate degree or some other schooling to get a job. from what I have seen a BS in Stats doesn't have a lot of job prospects with that degree alone.

-It was great to have professors who are passionate and care about their students' success.

-It was a joy to work with you all!

-In general, I would say that mathematically I was set-up well for a graduate program in Statistics. However, statistically I was not prepared. I didn't leave the program with some fundamental understandings that are "typical" for introductory statistics courses, like the scope of inference for a study. I faired my graduate program well because of my computer science class, without which I don't know where I would be today.

-I really struggled in a few of the undergraduate courses at CMU but I persevered with the help of some incredible professors who challenged me and were open to helping me when I came in to office hours! Thank you so much!

-I honed my critical thinking skills and my problem-solving skills in the math program. The faculty also helped me to develop my ability to use logic and reasoning to solve a problem.

-I also really liked Ed's Geometries class. I thought the assignment about developing the Pythagorean Theorem from Euclid's Postulates was really interesting.

-Dr. King was a great addition to the Stats Dept. while I was at CMU. The university should do everything in its power to keep him there and to let him teach as many upper division classes as possible. He is very good at getting students to engage with the material of the courses he teaches.

External Review of Mathematics & Statistics Department
Colorado Mesa University
Prepared by Rick Hudson, University of Southern Indiana
Spring 2022

Executive Summary Table

Program Review Element	Check the appropriate selection				Provide explanation if not agree with element and/or why unable to evaluate
	Agree	**Not Agree**	**Unable to Evaluate**	**Not Applicable**	
The program's self-study is a realistic and accurate appraisal of	X				
The program's mission and its contributions are consistent with the institution's role and mission and its strategic goals.	X				
The program's goals are being met.	X				
The curriculum is appropriate to the breadth, depth, and level of the discipline.	X				
The curriculum is current, follows best practices, and/or adheres to the professional standards of the discipline.	X -				Overall, the curricula in mathematics, applied mathematics and statistics are sufficient. As documented in the narrative, curricula in actuarial science and mathematics teaching are sufficient, but could be modified to more closely align to curriculum expectations in the discipline.
Student demand/enrollment is at an expected level in the context of the institution and program's role and mission.	X				
The program's teaching-learning environment fosters success of the program's	X				
Program faculty members are appropriately credentialed.	X				
Program faculty members actively contribute to scholarship, service and advising.	X				

Campus facilities meet the program's needs.	X				
Equipment meets the program's needs.	X				
Instructional technology meets the program's needs.	X				
Current library resources meet the program's needs.	X				
Student learning outcomes are appropriate to the discipline, clearly stated, measurable, and assessed.			X		The department has identified student learning outcomes for each concentration that are appropriate and clearly stated. However, the assessment data and results were not available. Although the outcomes appear to have been assessed, without data or assessments, I was not able to evaluate the appropriateness of the assessments. There is no evidence that all student learning outcomes are assessed in every program.
Program faculty members are involved in on-going assessment efforts.	X				
Program faculty members analyze student learning outcome data and program effectiveness to foster continuous improvement.	X				
The program's articulation of its strengths and challenges is accurate/ appropriate and integral to its future planning.	X				

Narrative

This narrative documents my findings and recommendations based on the following actions:

- Review of the CMU Mathematics & Statistics Department Program Review Self-Study for Academic Years 2014-15 through 2020-21
- Examination of the departmental website and university course catalog
- Review of prior external reviewer's narrative and recommendation

- Visit to campus on March 7, 2022, including conversations with the following individuals:
    - VP for Academic Affairs
    - AVPAA for Faculty Success
    - AVPAA for Assessment
    - Library Director & Library Liaison
    - Mathematics & Statistics Department Head
    - Mathematics & Statistics Faculty
    - Current Students
    - Alumni
    - University President
- Observations of two classes (MATH 110, Mathematical Investigations & MATH 490, Abstract Algebra)
- Review of selected departmental course syllabi

Overall, I believe that the CMU Mathematics & Statistics Department maintains high expectations for students and engages in opportunities to continuously enhance students' opportunities for learning. My conversations with students and alumni were particularly enlightening, as they provided strong justification that the department is producing graduates who are mathematically literate and well-prepared to enter graduate study and/or the workforce. There is strong evidence that the faculty makes decisions in the best interest of students, and they have addressed needs identified by the previous self-study and external review.

Self-Study

The self-study is a well-written document that describes the history of the department, the current curriculum and challenges, and future aspirations of the department. The only concern I have with the self-study itself is lack of assessment data for all program outcomes, which I describe in more detail below. The findings of the self-study are consistent with my conversations with faculty, administrators, students, and alumni that I met with during my visit.

The department is to be commended for the numerous changes that it has addressed as a result of its prior external review. New courses and concentrations have emerged that will appeal to a larger number of students. Course revisions (e.g., the shift from a Senior Seminar to Senior Capstone) have addressed scheduling concerns for students and provided more flexibility for the changing needs of students.

Alignment of Institution Mission and Goals

When I first read the CMU Mission statement, I was struck that it began with the phrase "Committed to a personal approach…" Based on my conversations with students and alumni in the department, I am happy to report that the department is successful in its commitment toward making the study of mathematics and statistics "personal." Students described the faculty as "open," "honest," "understanding," and as individuals who

"prioritize connections." Small class sizes foster opportunities to strengthen the personalized faculty-student connections, and alumni have documented class size as a strength of the program. Maintaining sections with low student-teacher ratios is a best practice by the department and should continue to be a priority. Students and alumni identified the opportunities they have had to grow professionally and personally at CMU, such as meeting individually with faculty outside of designated class times and participating in events like the Math Extravaganza.

The Institutional mission also suggests that CMU advances Colorado by encouraging "diversity, critical thinking, and social responsibility." Female students in the department attributed part of their success in the department was due to multiple female role models in faculty positions. Faculty noted the personalized approach to teaching is itself an equitable practice. The department has also made efforts to address social responsibility in the curriculum through the re-imagining of students' capstone experiences in the department. It is evident that the department is making efforts to address the institutional mission and should continue to make decisions that foreground diversity and social responsibility.

Curriculum

The department has demonstrated steps to expand and enhance its curriculum offerings since the last program review. During the past seven years, they have developed two new major concentrations in the department (Applied Mathematics and Actuarial Science) and a graduate certificate program (Applied Mathematics). These new curriculum opportunities address current students' needs to align their collegiate curriculum with career objectives.

The department has identified required coursework for all majors in the department, which includes calculus, computational linear algebra, probability/statistics, computer science, as well as the Topics & Careers in Mathematics course. The department's curriculum for the Mathematics concentration is aligned with most recommendations of the Mathematical Association of America's *2015 CUPM Curriculum Guide to Majors in the Mathematical Sciences.* These recommendations include a focus on proofs; the inclusion of data, computing, and modeling; curriculum that addresses both the breadth and depth of mathematics; work on a substantial mathematical project (i.e. capstone); and an orientation to careers in mathematics.

As outlined further in my recommendations below, there is a need to revise the Actuarial Science curriculum to better align with actuarial exams and to meet SOA's Validation by Educational Experience (VEE) requirements. In addition, alumni from the Secondary Education concentration identified that the program could be improved with additional coursework in pedagogy. I agree that the current program's curriculum is minimal compared to most peer institutions. Potential curriculum changes to the Secondary Education concentration are also discussed in the recommendations below.

Evidence exists that the department regularly reviews and revises their curricula. The MATH 150 course, Topics and Careers in Math, was introduced in Fall 2016, and addressed prior concerns that students needed more robust knowledge about career options in the mathematical sciences at an earlier point in their program. This addition is particularly notable, as it is one of the most thorough approaches that I have seen to address MAA's expectations that undergraduate students receive support to learn about careers in the mathematical sciences. The faculty have designed an interesting and engaging course that prepares students to experience noteworthy mathematical topics and learn professional skills, such as use of LaTeX and communication skills. Students also stated this course was particularly helpful to learn about different career opportunities that majors in the department may lead to. Additionally, the previous Senior Seminar was replaced by MATH 492, Senior Capstone, to meet the social/ethical goals described above and to alleviate scheduling pressures for students graduating at the end of a fall term. MATH 110, Mathematical Investigations, has also been revised to integrate more mathematical modeling and problem-solving into a course. The department is currently designing a new version of its College Algebra course that will be more applied. This approach is aligned with national efforts that have called for more relevance to the College Algebra curriculum, and to focus on the needs of individuals who are taking College Algebra from non-STEM majors.

The introduction of a new concentration in Applied Mathematics has created the opportunity to develop an impressive three-course sequence in Applied Math (MATH 360/366/466) that includes content in vector calculus, differential equations, numerical methods, and modeling. The course sequence also provides opportunities to learn technological tools that are common in the workforce.

A particular strength of the program is the wide variety of elective courses that are available to majors within the department. Upper-level courses in mathematics and statistics are offered on a regular rotation. Although some elective courses cannot be offered every year, the rotation provides opportunities for students to take a wide variety of courses throughout their college career.

Student Enrollment

Student enrollment in mathematical sciences nationwide tends to be smaller than many other majors. The number of majors within the department at CMU has remained relatively steady across the past six years (if excluding the Elementary Education majors concentrating in mathematics). As the department has diversified offerings at the undergraduate level, the department has seen a slight decline in mathematics majors, as students in applied mathematics and actuarial science has been introduced as alternatives. Efforts within the department and across campus should be made to continue to consider new alternatives for recruitment and retention into mathematics and statistics. I believe the introduction of the MATH 140 is a positive move to help undergraduates early in their academic career to learn about options of majoring within the department. With regards to secondary education majors, I encourage the department to utilize resources such as the

[Get the Facts Out campaign](#) to help students understand some of the myths about working in K-12 education.

Teaching & Learning

The two class sessions that I observed provided me with interesting opportunities to understand the learning environment within the department and to see differences between engaging introductory and upper-level classes. A major strength of the department is the careful attention that has been made to create the MATH 110 course, entitled Mathematical Investigations. Although I am sure the process was time-intensive, considerable effort has been expended to produce a high-quality course. The project-based nature of this course addresses the needs of students who are not seeking degrees in quantitative-intensive fields. I observed evidence that MATH 110 required students to understand mathematical skills and concepts, and the concepts were embedded in rich contexts of financial mathematics. Mrs. Hansen ensured that students were well supported in their work on a long-term project, and it was evident that student-faculty interactions were positive.

Similarly, Dr. Miles created a positive learning environment in his MATH 490 class, where students were learning about isomorphisms. Dr. Miles ensured that he connected the content of the course with prior learning experiences. I was particularly impressed with the environment where students felt free to ask questions, to engage in productive struggle, and to work collaboratively to solve challenging problems that are appropriate for students at the level of introductory abstract algebra. Evidence exists that these are normal practices in this class, and exploration and persistence are explicit goals set by the instructor in the course syllabus. The small class sizes provided opportunities for Dr. Miles to give feedback to individual groups as they worked. Overall, the course included many high-quality practices for teaching undergraduate mathematics majors.

Faculty in both classes were well-organized, communicated content clearly and precisely, and promoted student engagement through solving and discussing rich problems.

Students who have completed programs in the department have pursued a wide variety of career paths and various fields for graduate study. These are strong indicators that the learning environment in the department is successful in promoting the learning of mathematics and statistics.

Another strength of the program's learning environment is the activities that students engage in outside of the traditional classroom. For example, an active Math Club helps to create a social environment to support the academic work of the department. Students reported that their attendance at math conferences and talks during lunch seminars were also valued.

Looking toward the future, a particular challenge that the department will face is the statewide mandate to cap the percentage of students who are taking developmental math coursework. CMU is taking steps to help students prepare for collegiate work and review previously learned content through learning modules. However, I anticipate there may

need to be other supports provided to students who would have previously enrolled in developmental mathematics coursework. For example, the department may consider using courses that meet more hours throughout the week or employing supplemental instructors (experienced student peers) to provide additional resources for students.

Program Faculty

Arguably, one of the greatest strengths of the department is the high-quality faculty. As documented in the alumni survey and in my conversations with alumni and students, the faculty is a group of caring, honest, and approachable individuals. My personal conversations with the faculty indicated that the faculty are collegial and committed to student success.

The program faculty are well-qualified for their current positions, and the majority have graduate degrees in mathematics. The department has a process in place to ensure that new faculty and dual credit faculty have a minimum of 18 credit hours in mathematics or statistics. Faculty have been awarded external grants from the MAA, been active in the SIMIODE initiatives, and contributed to service activities at national and local levels. Faculty have published in peer-reviewed journals and participated in curriculum development initiatives that have resulted in textbooks. Overall, the academic reputation of the program's faculty is commendable.

The number of full-time faculty in the department has increased since 2014, however the number of tenure-track faculty has decreased by one. Class sizes in introductory statistics may reach 50 students, which is a large class for mathematical sciences. Given the university's emphasis on creating personal learning experiences and the individual attention that students admire about the department, I would recommend that steps be taken to decrease the average class size of introductory statistics. As new hires are considered for the department, I believe additional faculty lines devoted toward tenure-track statistics and mathematics education would enhance the department. This recommendation is consistent with findings from the prior external review, which have not yet been addressed. An additional hire in statistics would help to reduce the size of the introductory classes.

Faculty have professional learning opportunities that promote growth and reflection. For example, many faculty members participated in Teaching Trios in which they visited others' classes. This provided them reflect on how others teach and their own instructional choices. In addition, faculty have participated in Communities of Practice that seek to engage faculty in continued learning opportunities. These are best practices, and I encourage the department to develop regular communities of practice for faculty to continue to learn and grow together. I agree with the self-study's recommendations that a Community of Practice focusing on issues of equity would be beneficial.

The self-study's results suggested that identifying course coordinators is a needed resource for the department. I support this recommendation. By identifying course coordinators for each course with multiple sections taught, the department can ensure that there is consistency in content coverage. These individuals can serve as resources for individuals teaching a course for the first time and provide ongoing professional development related to a particular course. They can spearhead assessment initiatives for the course and help to manage shared course materials.

Facilities, Equipment, and Technology

Throughout my visit on campus, I found the facilities for teaching and office space appropriate for the program. As resources become available, the department would benefit by transitioning some classrooms with tablet-arm chairs to seating with moveable tables and chairs. Tables and chairs are more conducive to collaborative learning, provide 21st Century learners with more space to balance laptops/books/notebooks, and are more comfortable for students of diverse sizes.

Students have access to equipment and technological tools as needed and when appropriate. Multiple technological tools (e.g., Python, MATLAB, R) are incorporated into various courses.

Library Resources

The CMU Mathematics and Statistics Department appears to have a strong relationship with staff in Tomlinson Library. Library staff meet with students enrolled in their capstone course to ensure students are able access the resources available to them through the library. The library collection includes a number of titles related to mathematics and statistics, and the library is able to meet the needs of faculty through purchasing new titles when requested. Actuarial science is one topic area which the library does not currently hold any volumes. Students in actuarial science may benefit from titles that would assist with exam preparation. For example, ACTEX Learning provides print and electronic study manuals. (Note: The actuarial exams' content is changing in Fall 2022, so it may be best to wait to purchase until the printed materials are updated to correspond to new exam guidelines.)

Student Learning Outcomes, Assessment and Continuous Improvement

As described above, the learning outcomes for the Mathematics major are well aligned with the recommendations provided by the Mathematical Association of America's *2015 CUPM Curriculum Guide to Majors in the Mathematical Sciences*. Similarly, the statistics outcomes are reflective of the American Statistical Association's *Curriculum Guidelines for Undergraduate Programs in Statistical Science.*

All program learning outcomes should be assessed with some regularity. Although there are some similarities across the five undergraduate concentrations (e.g., each major has an outcome related to mathematical/statistical software), there are unique outcomes for individual concentrations. For example, I did not find evidence that the department has assessed some outcomes, such as the fifth outcome for Secondary Education (focusing on

the historical development of mathematics), the third and fourth outcomes for Statistics and Actuarial Science (focusing on applying procedures/justifying assumptions and evaluating validity, respectively), the first outcome for Applied Mathematics (focusing on modeling), or the sixth and seventh outcomes for Actuarial Science (focusing on communicating technical analyses and applying concepts from other fields). Given that Applied Mathematics and Actuarial Science are relatively new majors, it is understandable that not all outcomes were assessed.

Several of the assessments that were completed did not have data available to review, and the self-study was unclear about how the assessment process led to the decisions that were made. As described in the recommendations below, there are several steps that the department can take to create more streamlined learning objectives and an assessment data collection and data management plan should be adopted.

Recommendations (ranked in order of importance)

1. **Create a data collection and management plan for departmental assessment data and assess all student learning outcomes within each program.**

   An important aspect of program review and departmental self-study is the analysis and interpretation of assessment results. Assessments have the potential to help the department to gauge success in meeting program outcomes, and the "closing the loop" process that follows an assessment has the potential to inform future instruction and curriculum decisions. I was surprised as I read the self-study that the assessment data for three of four program outcomes had been "lost due to the resignation of a faculty member." Assessment should be a departmental mission. Consequently, data should be shared and analyzed by multiple members of the faculty, and there should be centralized storage for assessment data and other documentation (e.g., findings from the "closing the loop" process). I recommend that these documents be securely stored in electronic format where multiple individuals in the department have access to the data. At some institutions, the storage of such data happens at the institutional level.

   As the department moves forward with developing an assessment plan, I recommend the department develop a plan that ensures all outcomes are assessed. To streamline this process, I might recommend that the department identify some common outcomes across all programs (such as those focusing on problem solving, communication, ethics/social responsibility), and then one to three outcomes that are specific to each major.

2. **Revise the Actuarial Science Curriculum to more closely align with expectations described by the Society of Actuaries and provide additional support for students in the actuarial program.**

   The actuarial science program at CMU is still relatively new, however I anticipate student growth will continue to increase as the program becomes more established.

The Society of Actuaries classifies universities and colleges with actuarial programs (UCAPs) into three levels. (See https://www.soa.org/institutions/.) I recommend that CMU work toward meeting the expectations of a UCAP level that includes the introductory curriculum (UCAP-IC).

Transitioning to the UCAP-IC level may require several changes to the CMU curriculum. First, CMU would need to ensure that courses in their program meet the Validation by Education Experience (VEE) requirements for at least one of the three VEE topics: 1) economics; 2) accounting and finance; and 3) mathematical statistics. Although designation at the UCAP-IC level only requires one of these topic areas to be approved, it would benefit CMU actuarial science graduates to have all three VEE topics in the curriculum validated by the SOA. Currently, the actuarial science concentration includes courses that may benefit actuaries (e.g., CSCI 260 and ECON 415), but actuaries would likely have greater benefit from courses that correspond to the VEE requirements, such as courses in Microeconomics and Accounting. I recommend the mathematics faculty engage with business faculty to ensure the appropriate courses for VEE requirements are selected. By providing the coursework for VEE credit during the undergraduate program, students will not need to seek additional training after graduation or through alternative means.

A second expectation for CMU to be designated as a UCAP-IC is a requirement that the program covers coursework for a minimum of two SOA preliminary exams. At most institutions, this means that students take coursework in Probability (P) and Financial Mathematics (FM). I strongly recommend that the actuarial science curriculum include a new course focused on interest theory and financial mathematics that would prepare students for the FM Exam. At my own institution, we offer such a course on a two-year rotation. Given the current enrollments in Actuarial Science at CMU, I anticipate a similar rotation will be needed there initially. In addition to preparation for the test, a single course taken by all actuarial science students will help to build a community of future actuaries in the department.

In addition to curriculum changes, I recommend that CMU consider extra opportunities to support students to pass actuarial exams and seek actuarial internships. For example, the library or department could invest in print materials for exam preparation or provide students with electronic resources that support exam preparation. Internship placement opportunities were also identified in the alumni survey as an area for improvement within the department. At my own institution, most actuarial majors are advised by a single advisor who is familiar with the actuarial field and is equipped to support students studying for exams.

3. **Review the national recommendations for the professional education of mathematics teachers and align the Secondary Education concentration's curriculum more closely with national expectations.**

Students in the Secondary Education concentration take coursework in both education and mathematics. As a result, this program is interdisciplinary in nature, and responsibilities for instruction are shared across departments. The Conference Board of Mathematical Sciences (CBMS) has provided recommendations for "the mathematics that teachers should how and how they should come to know that mathematics" in their 2012 document *The Mathematical Education of Teachers II*. Similarly, the Association of Mathematics Teacher Educators (AMTE) has identified *Standards for Preparing Teachers of Mathematics*. As the department makes curriculum decisions about the Secondary Education concentration in Mathematics, I encourage them to use these resources to compare their program to national expectations. Admittedly, many of the recommendations have not been met by individual programs, and as a result some of these recommendations are aspirational.

There were several ways in which CMU's curriculum for future teachers could be modified to meet the CBMS and AMTE recommendations:

- CBMS calls for students to study abstract algebra with an emphasis on the algebra of rings and fields, which forms the basis of base-ten arithmetic and polynomial operations. Currently CMU does not require a course in abstract algebra for students in the Secondary Education concentration, however students may take this course as an elective.

- CBMS and AMTE call for coursework that consists of the equivalent of a degree in mathematics with at least three content courses that are relevant to the high school curriculum and that view the high school curriculum from an advanced viewpoint. AMTE also calls for "multiple opportunities for candidates to learn to teach mathematics effectively through the equivalent of three mathematics-specific methods courses. Taken together, these are lofty goals, that if implemented would require 6 courses (or 18 credit hours) of coursework that is specific to students in the Secondary Education Concentration. Although this may be an unrealistic goal for an institution of the size of CMU, the current coursework directed specifically for future secondary math teachers is a two-credit-hour methods course (EDUC 497C). Although I am familiar with many institutions who only have one or two methods courses for future secondary teachers, it is rare to identify a secondary education preparation program with fewer than three content-specific methods credit hours. Furthermore, CBMS (2012) describes that "Indeed, at many universities, enrollments in teacher preparation programs are too low to create special courses (and many majors don't decide to become teachers until late in their undergraduate program). Dual purpose electives can meet this recommendation if they meet the dual criterion of developing content expertise and reasoning skills described..." (p. 62). I encourage the CMU faculty to consider whether CBMS's description of the high school curriculum from an advanced perspective is incorporated into coursework for future teachers (e.g., Geometries, History of Mathematics). Admittedly, with the current enrollments in this concentration, it may be difficult to justify additional coursework, however the program would be

stronger if future teachers had more substantial experiences in mathematics pedagogy and if they revisited secondary curriculum topics from an advanced perspective.

Furthermore, my conversations with students alarmed me that they had received advice not to pursue a teaching degree, suggesting that they could pursue mathematics teaching without coursework specific to teachers. The CBMS and AMTE documents provide clear descriptions of why we should not consider having a strong mathematical content background as a sufficient basis to teach in K-12 schools. These documents also provide guidance about how strong programs in the preparation of mathematics teachers will specifically address future teachers' needs.

4. **Provide dedicated time for faculty to engage in work that enhances curriculum and scholarly work.**

Currently, CMU faculty within the Mathematics and Statistics Department teach 24 credit hours during each academic year. Tenured and tenure-track faculty have a heavy number of course preps and usually one or two new course preps per year. Furthermore, the faculty perceive that the requirements for scholarship with regards to promotion and tenure have increased in recent years. With such heavy teaching loads, faculty have minimal time to engage in scholarly work throughout the academic year. There have been examples of faculty release hours for curriculum development at CMU, such as time granted for the redesign of MATH 110. The department would benefit from regularly scheduled load release. For example, a policy within my own College allows each department to assign 12 credit hours of flex release per academic year (usually six per semester). Departments within my college use this time for various reasons, including innovative curriculum development, research/scholarly work, recruitment initiatives, etc. Although the hours are assigned at the chair's discretion, an Associate Dean in the college oversees the process. Individual faculty members must set goals that are aligned with the number of credit hours of flex release, and at the end of the term, they must complete a report documenting their work on those goals. Additional release time also has the potential to increase faculty morale by acknowledging load for extra responsibilities that they take on.

Department of Mathematics and Statistics

Rejoinder

In regard to the statement:

"Furthermore, my conversations with students alarmed me that they had received advice to pursue a teaching degree, suggesting that they could pursue mathematics teaching without coursework specific to teachers. The CBMS and AMTE documents provide clear descriptions of why we should not consider having a strong mathematical content background as a sufficient basis to teach in K-12 schools. These documents also provide guidance about how strong programs in the preparation of mathematics teachers will specifically address future teachers' needs."

The Department of Mathematics and Statistics would like to respond with the following statement:

While some former students have received this advice, it is not the position of the department nor the majority of its faculty. And while we work to ensure students understand and value the courses and training specific to teaching, it is clear that we must and will continue to emphasize their importance to students and faculty alike. In fact, to replace our retiring full professor, Dan Schultz-Ela, who specialized in Mathematics Education at the elementary level, we have hired a new tenure-track faculty member (to begin in Fall 2022) who has broader experience and active research in Mathematics Education with the goal of having this person help to promote and grow our concentration in Secondary Education.