COLORADO MESA
UNIVERSITY

AY 2014 – 2015
Program Review

Mathematics

Mathematics Program Review Self-Study for Academic Years 2008-09 through 2013-14

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1. Introduction and Program Overview

a. Program Description by Level

The mathematics program is part of the Department of Computer Science, Mathematics and Statistics and consists of several subprograms. In particular, we offer B.S. degrees in pure Mathematics, Mathematics with a concentration in Secondary Education, and Mathematics with a concentration in Statistics. We offer an Associate degree in Mathematics and Minors in Mathematics and Statistics. Detailed descriptions of each subprogram's requirements can be found on the program sheets in Appendix A.

b. A Brief History of the program

The baccalaureate-level mathematics program has evolved with the institution from a Bachelor of Science in Physical Science and Mathematics that required an emphasis in computer science, mathematics or computer science and applied mathematics in 1980 to a Bachelor of Science in Mathematics with concentrations in pure mathematics, secondary education and statistics beginning in 1991. 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 that general education coursework became part of the mathematics program as well. A more detailed history of the mathematics program can be found in Appendix B.

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

The external reviewer for the 2003 – 2008 Mathematics Program Review was Dr. Seth Armstrong from Southern Utah University. Dr. Armstrong felt that the curriculum for the mathematics program was very strong and that our graduates were better prepared for graduate school than at many comparable institutions and he was impressed that 2/3 of the current students and alumni would choose the program all over again.

We have addressed several recommendations made by Dr. Armstrong for strengthening our program.

First, Dr. Armstrong called for making MATH 119, Pre-calculus, the prerequisite for Calculus I, which is now in place. Second, the reviewer felt we needed to address the transition from MATH 240, Introduction to Advanced Mathematics, to 400 level mathematics courses. This was done in several ways:

- We actively advise our students in a manner that prepares them for a successful procession through our program.
- In order to provide more in-depth coverage of material the credit hours of MATH 240 were increased from 3 hours to 4 hours.
- We added a prerequisite of at least one of MATH 310, Number Theory, MATH 325, Linear Algebra, or MATH 352, Advanced Calculus to our required 400-level, proof-based courses.
- Required 400 level courses are now offered more often so that students don't feel rushed into taking those courses in order to graduate within a particular timetable.
- A new course, MATH 415, Abstract Algebra for Secondary Education, was added to give MathEd majors more flexibility in their schedules.

The reviewer was interested in exploring ways to improve pass rates in MATH 113 College Algebra. While our pass rates exceeded the national average, he discussed placement scores, common final exams, and offering MATH 091 Intermediate Algebra for college credit. We have explored all of these options, except offering MATH 091 for credit towards graduation, which is mandated by the State of Colorado. We have instead introduced modified versions of MATH 091 to better address the needs of the students, and have developed a new course, MATH 096 (the course will be renumbered once it goes through the Curriculum process), which is designed to fill the needs of students who might not yet be ready for MATH 113, College Algebra, but who also don't need to take an entire semester of MATH 091. Special sections of MATH 113 that meet five days a week (four days of instruction and one day of recitation) are recommended for students who earn a C in MATH 091. Another change that has occurred is that following an extensive investigation of student data, the Working Group for the Improvement of Student Academic Success (WGISAS) suggested several changes which have been implemented. This includes not allowing students to self-place into math classes, a vast improvement over earlier practices. Another change suggested through the Self-Study process for HLC, which has been adopted, is the "comparable courses" criteria. Now, all sections of Math 113 follow the same content criteria, all use the same textbook, and all are required to use the mathematical software available with the texts. These insure continuity of instruction in the multiple sections, settings, and modalities.

Dr. Armstrong felt there was a need to add a mathematics education PhD or ED faculty (which we have not obtained permission to do) and that we should hire another faculty member in statistics (which was accomplished in Fall 2013). Since 2008, we have lost three tenured mathematics faculty to retirement (with another retiring at the end of the 2014-15 academic year) and have hired three tenure track faculty which includes the statistics hire. In 2008 there were 13 tenured/tenure-track mathematics/statistics faculty teaching full-time (excluding the Department Chair), in 2014 there are 13 tenured/tenure-track mathematics/statistics faculty (again excluding the Chair) but the addition of the much needed statistician decreased the number of mathematics T/TT positions. Dr. Armstrong felt that "…hiring adjuncts should not be the first way to go as programs start losing credibility when the full-time [sic] to adjunct ratio decreases significantly."

Despite this, the percentage of Student Credit Hours (SCH) taught by T/TT faculty has gone from 59% for mathematics and 84% for statistics in 2008-09 to 35% and 47% respectively in AY 2013-14 with adjunct faculty teaching the balance. It is noteworthy that according to census data published by CMU, the overall student enrollment has increased from 6,061 in Fall 2008 to 8,666 in Spring 2014, an increase of 43%.

In response to the reviewer's remarks concerning technology, there is now conformity in the lower level (200 level) stats classes regarding technology use. For STAT 200, all students are required to use a TI-84 (or 83) graphing calculator and also use online homework system (e.g., ConnectMath or MyMathLab).

Dr. Armstrong recommended that if the department considers moving from a degree in mathematics with a concentration in statistics to a degree in statistics that we consider replacing more theoretical mathematics courses with additional statistics courses. Such a change is still under consideration. As noted earlier, the department recently hired a tenure-track faculty member in statistics in accordance with Dr. Armstrong's recommendation and this new faculty member has helped to alleviate the other statistics professor's overload.

Initial steps have been made in reviewing various actuarial programs both inside and outside of the state of Colorado. Conversations with the CMU Business Department have been undertaken to determine if there is sufficient need to begin an actuarial science program. The Business Department is looking into new business courses that may be added in addition to assessing how current business courses could be modified to fit the needs of actuarial science students.

With regards to student comments expressing a desire for more training in applied statistics and statistical software, the department has incorporated both suggestions into the statistics program. For example, STAT 215, Statistics for Social and Behavioral Sciences, was created for students in the Social and Behavioral Sciences to receive hands-on training in the widely used Statistical Package for Social Sciences (SPSS). The department is also considering the future use of programs such as Excel in STAT 200, Probability and Statistics. A popular open-source high-level statistical package, R, is being used in STAT 311, Statistical Methods, to provide students the opportunity to perform statistical analyses as practiced by professional statisticians. R is also used in STAT 412, Correlation and Regression, and STAT 425, Design and Analysis of Experiments. A one-to-two credit hour course that will teach the use of statistical software (R, SAS, SPSS, Excel) is being considered for development.

Offering opportunities for students to work on applied statistics has been and will continue to be an integrated part of the upper level statistics curriculum. Statistics students are required to take the Senior Seminar course and do a statistics-oriented project of their choosing. Oral presentations and written submissions are required and evaluated by the statistics faculty. In preparation for this, there has been an increase in writing assignments (e.g., report writing), and real-world projects in many of the upper level applied statistics courses (e.g., STAT 311, Statistical Methods).

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 and its faculty are devoted to meet the goals set out in this statement both in service to other programs and within the mathematics program itself. Mathematics courses that satisfy the General Education mathematics requirement and courses for students seeking a degree in mathematics 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. All of these skills are essential for post-graduate success and lifelong learning. Further, these courses engage students in a wide range of powerful ideas that have important applications and are core to a vast number of careers including mathematics, computer science, engineering, physics, chemistry, biology, exercise science, business, and others. To that end, the CMU

Mathematics Program Mission states:

The CMU mathematics department works enthusiastically, in each of our classes and also through extracurricular activities and interactions, to help students to obtain the level of quantitative literacy and critical thinking required for their personal and professional success.

For the first half of this review cycle, the mathematics program followed the goals and objective laid out in Appendix A. In fall of 2012, all academic programs began the transition to Student Learning Outcomes. These are articulated in Section 5a.

e. Support of other programs

Every student earning a B.S. or a B.B.A. degree from Colorado Mesa University must take College Algebra (MATH 113) or higher, and students earning a B.A. degree must take College Mathematics (MATH 110) or higher in order to meet general education requirements. These two courses constitute approximately 50 percent of the mathematics courses taught in the department each semester.

Colorado Mesa University awards both associate and baccalaureate degrees. Different degrees require various levels of mathematics and/or statistics expertise. Therefore, in addition to providing general-education coursework, the mathematics program supports a number of other majors by offering courses such as Probability and Statistics (STAT 200), Statistics for Social and Behavioral Sciences (STAT 215), Statistics and Quality Control for Engineering (STAT 305), Calculus for Biology (MATH 146), Business Calculus (MATH 121), Engineering Calculus I and II (MATH 135-136), Differential Equations and Linear Algebra (MATH 236), Numerical Analysis (MATH 361), the three-course sequence (MATH 105, 205, and 301) required for all Liberal-Arts Majors in the Elementary-Education option and Mathematics for Elementary Teaching (MATH 389). Also, majors in the Physical Sciences are required to complete the standard Calculus sequence. Thus, the mathematics program plays an integral role in preparing students for their coursework in many of the majors in the University. 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. To succeed in this endeavor, members of the mathematics faculty meet periodically with members of other departments to review the content contained in the service and support courses.

f. Locational/comparative advantage

CMU is the only institution of higher education within 200 miles to offer a major or concentration in statistics. In addition, few institutions that are comparable to CMU offer a concentration in statistics supported by two tenured/tenure track faculty with Ph.D.'s in statistics. Our statistics faculty and students regularly perform data analysis for select local businesses and individuals in need of statistical consulting, often as part of our senior seminar sequence. This provides opportunities to build connections with members of the local community and provides a service to our region. In addition, our mathematics graduates are often able to find employment on the Western Slope which is beneficial to the local economy.

g. 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 our size and with our mission. We have:

- a weekly (1-credit) mathematics seminar that has been active for over 18 years.
- rotational offering of courses which allows us to offer a variety of upper division electives that are not typically offered in a mathematics program our size.
- an intensive year-long undergraduate research experience
- a strong secondary education program of coursework that exceeds the state requirements for secondary licensure.
- ample opportunities within our department for our students to serve as teaching assistants, study group leaders, and tutors. These opportunities are especially important for future teachers and for students planning to seek graduate teaching assistant positions.

We consider our unique characteristics to be some of our strengths. They are described in more detail in Section 6b.

2. Curriculum

a. Description of Curriculum

Courses offered through the mathematics program are designed to help students *develop a correct interpretation of the objects of mathematics, the relationships that exist between those entities* and *the logical and meta-logical skills necessary to reason correctly about those interpretations*. With a major in mathematics, students gain an understanding of the nature of proof, a broad general understanding of mathematics, and a deep understanding of at least one area of mathematics. Students who choose a Concentration in Secondary Education gain the breadth of mathematics content, conceptual understanding and meta-reasoning necessary to be successful high school teachers. With a Concentration in Statistics, students develop an understanding of statistical reasoning and correct use of statistical procedures.

In addition to providing coursework for the mathematics subprograms listed above, the mathematics program also serves the greater campus community by providing mathematics and statistics courses for other programs including those that satisfy the Colorado Mesa University General Education mathematics requirement and the Liberal-Arts major with an Elementary Education Concentration in Mathematics.

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

Several curriculum changes were made since the last department review to accommodate the growing number of programs at CMU. We have developed a sequence of new courses designed to support the new Mechanical Engineering program, offered by the University of Colorado Boulder on our campus. This includes the design and implementation of MATH 135/136 Engineering Calculus I and II; and MATH 236 Linear Algebra and Differential Equations. In Statistics, to address the demands from outside departments as well as the need for more electives, three new statistic courses were established. STAT 215 Statistics for Social and Behavioral Sciences is a course with applications specific to the Social and Behavior Sciences while STAT 305 Statistics and Quality Control for Engineering was added at the request of the mechanical engineering department. NURS 625 Statistics for the Health Sciences is taught for the Doctor of Nursing Practice (DNP) program.

To better prepare our future teachers for the classroom, we also modified requirements in the elementary and secondary education programs which necessitated the development of three new courses. A one credit course, MATH 389 Explorations in Mathematics for Elementary Educators, was created to replace the MATH 394 Mathematics Colloquium requirement in the Mathematics concentration of the Elementary Teaching program. For the same program, CSCI 305 Technology for Mathematics Educators was created as an alternative to the CSCI 110 Beginning Programming requirement. For Mathematics majors with a concentration in Secondary Teaching, MATH 415 Abstract Algebra for Secondary Education was designed as an alternative to the MATH 490 Abstract Algebra I program requirement and is focused on the algebraic structures more relevant secondary mathematics.

In addition, a new elective course was added to the mathematics program. The course MATH 362 Fourier Analysis is a unique and valuable course not typically found in undergraduate programs. This course introduces students to the mathematics of signal processing, including MP3 and JPEG compression, as well as other calculus-based methods for processing sound waves and digital images.

c. Program delivery

All courses in the mathematics program are offered on the main campus and some of those courses, primarily general education, are also offered at the Montrose campus and at select regional high schools as part of the Early Scholars program. The general education courses MATH 110 (College Math), MATH 113 (College Algebra) and STAT 200 (Statistics) are offered in a standard classroom format and online. To accommodate as many students as possible, they are offered on-site every semester including summer term and at least once a year in the evening. 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, MATH 113 is also offered as a five-day a week course. As mentioned earlier in this document, a rotational offering of courses for students majoring in mathematics allows us to offer a variety of upper-division courses. A schedule of our course offerings can be found in Appendix A.

3. Analysis of Student Demand and Success

a. Number of majors and minors

In the previous review cycle, the average number of declared majors each fall term was 72. As seen in the table below, the number of declared mathematics majors in our department was fairly consistent over the 2009-2014 time period and indicates an increase over the previous review cycle. A more detailed data set can be found in Table A in Appendix D.

Academic Year	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
Declared First Majors (fall term)	133	131	164	134	139	121

b. Registrations and student credit hours by student level

The data indicate that most Student Credit Hours (SCH) in mathematics are generated by freshman and sophomores. This is evidence that most students fulfill their College Mathematics, MATH 110, or College Algebra, MATH 113 requirement early in their college career. Since these classes are prerequisites for STAT 200 there is a corresponding increase in enrollment in statistics classes at the sophomore and junior level.

Furthermore, the Student Credit Hour data show that the vast majority of students do not take classes beyond the 100 level in mathematics or the 200 level in statistics. However, the number of SCH in 300-400 level courses has seen uneven growth which may correspond to an uneven increase in majors but also to fluctuation of student numbers in allied degree programs, like physics, engineering or computer science. Students who plan to go to graduate school in any of the sciences are better prepared if their background in mathematics and statistics is greater than what is typically required in their majors. This is due, in part, to the growth of computer modeling that allows real-time study and graphical representation of computationally tedious/complex mathematical models. The Student Credit Hour data can be found in Table E in Appendix D.

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

It is not surprising to see that the largest number of SCH are in lower-level classes and that there is, in general, an inverse relationship between the number of students enrolled in a class and its level. What distorts the numbers is that all students are required to take at least MATH 113, College Algebra, or MATH 110, College Mathematics, so although the number of mathematics majors in the three concentrations has grown and is in line with the percentage of mathematics majors nationwide, the SCH are more skewed towards the lower-level classes than in other programs. See Table F in Appendix D for the appropriate data tables.

d. Number of graduates by concentration

The table below shows the number of mathematics program graduates in each concentration for the past six years. As indicated in our previous program review, during the five-year period including academic years 2003 through 2007, 42 students graduated with BS degrees in mathematics. During the current six-year review period there have been over 70 such graduates.

Degree	Major	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
AS	Liberal Arts Mathematics	1	2	1	1	2	3
BA	Liberal Arts, Elem Teaching Math	4	3	6	5	6	5
BS	Mathematics	3	4	3	8	4	4
	Mathematics, Secondary Cert	9	2	9	1	5	5
	Mathematics-Statistics	7	1			3	5
Total		**24**	**12**	**19**	**15**	**20**	**22**

See Tables C and D in Appendix D for the complete graduation data table.

e. One-year retention rates and four- and six-year graduation rates

CMU, in particular Academic Affairs, Student Services, Department Chairs, faculty and staff have worked hard to retain all students. The Mathematics and Statistics faculty recognize that success in the entry-level courses for a discipline helps retain students. For our program, Calculus I is that course. As a result faculty encourage students to attend and participate in class; there is a calculus help session meeting twice a week run by upper-level mathematics majors that is available for all students in introductory calculus classes (including Calculus for the Biological Sciences and Business Calculus) and instructors are encouraged to participate in the *Early Alert* notification system that informs students if they are not doing well in their classes. Students experiencing personal problems are referred to Student Services as soon as a problem is encountered and faculty often have contingencies built into their grading scheme to accommodate those events. Majors are also assigned an advisor and faculty are very proactive in this regard. Retention rate data can be found in Tables J and K in Appendix D.

f. Student successes/recognitions

Graduates of the mathematics program graduate have robust skills that are universally applicable and unique among the other degree programs. Four CMU students have completed NSF REU projects in the last three summers. At least three CMU graduates have entered graduate programs in mathematics or statistics. Two recent graduates (2013 and 2014) gained immediate employment in management-track jobs in the financial and insurance sectors. Another (2013) gained immediate employment at a non-profit that prioritizes and manages waiting lists for organ transplants. Almost all of the graduates of the secondary education concentration are now teaching. Senior Seminar projects are often presented at the Student Showcase Symposium, a venue for students to present their research or projects to the greater CMU community.

4. Academic Program Resources

a. Faculty

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

The FTES/FTEF ratios for mathematics have ranged from 19.5 to 20.5 and the ratios for statistics have ranged from 25.1 to 26.8. The difference between the two ratios is a result of having fewer FTEF in statistics. The addition of a new tenure track faculty in statistics has allowed more sections of statistics to be taught by a T/TT faculty member which has increased the percentage of SCH for T/TT from 28% in AY 2012-2013 to 47% the following year. See Table I in Appendix D for FTES/FTEF data tables.

2) Course credit hours and student credit hours by faculty type.

As noted earlier, there has been a considerable increase in student enrollments at CMU. The number of tenured/tenure-track faculty has remained flat over this time period so that the majority of CCH/SCH is covered by adjunct faculty. It not surprising that the percent of CCH/SCH covered by T/TT faculty has decreased steadily from 55% in AY2009-10 to 35% in AY2013-2014 for mathematics and from 55% to 45% during the same time period for

statistics
See Table H in Appendix D for the corresponding data tables.

3) Faculty successes/quality/recognitions.
Senior-level students majoring in pure mathematics or mathematics with a concentration in statistics are required to conduct a research project under the mentoring of a faculty member. These projects are at a level that faculty deem appropriate for undergraduate-level research but often these projects include new ideas while still being accessible to the students. Over the last evaluation period, 11 tenured/tenure-track faculty in mathematics/statistics have mentored student research. The number of students conducting research each year as part of their M484/494 Senior Seminar course requirement is indicated in the table below.

	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	Total
Mathematics	**4**	**5**	**3**	**8**	**5**	**6**	**31**
MathStat	**7**	**1**	**0**	**0**	**4**	**6**	**18**
Total:	11	6	3	8	9	12	49

Unlike research in many other disciplines where data generation or collection can be accomplished even by undergraduates who are quite early in their major, mathematical research requires a great deal of depth and breadth of mathematical knowledge/skills that makes possible the deep and focused abstract thinking needed to generate the models, proofs, or counter-examples that characterize contemporary mathematical practice. As a result, the research generated in these projects takes considerable time and effort on the part of both student and faculty mentor. So although this is not typically cutting edge research in mathematics or statistics, it is research both in spirit, execution and time commitment. Mentoring of these student projects is not part of the faculty member's teaching load. It should be noted that one adjunct instructor and two CS faculty members have occasionally helped with mentoring when a student's interest led in their directions, but this assistance has been rare.

The (Brown Bag) Mathematics Colloquium has meet weekly for the past 18 years. Colloquium talks give mathematics students valuable exposure to topics that may not normally be encountered in program coursework as well as to some of the many applications of mathematics and computer science. While students and individuals not affiliated with CMU speak occasionally, the majority of the talks are provided by program faculty.

Mathematics and statistics faculty have been very active in providing service both within the department and on campus-wide committees. For example, recently the SLO and HLC committees have received well-considered input from the mathematics and statistics faculty especially in the area of quantitative reasoning.

Other measures of the professional successes/quality/recognitions of the mathematics and statistics tenured/tenure-track faculty include numerous publications/reports/abstracts, journal participation (editing or publishing), invited talks or presentations outside of CMU, grants awarded (external or internal), grant participation, conference/workshop participation, active membership in professional organizations, participation in course development, and mentoring student research including those projects that result in publications or presentations. Please see faculty vitas in Appendix C for individual faculty successes.

4) Faculty list and vitas

A list of current Tenured/Tenure-track and adjunct faculty can be found below.

Current Tenured and Tenure-track Faculty of Mathematics					
Name		**Degree**	**Expertise**	**Position**	**Year(Start)**
Catherine	Bonan-Hamada	PhD	Complex Analysis	Professor	1996
Ed	Bonan-Hamada	PhD	Logic and Foundations	Assoc. Prof.	1997
Lisa	Driskell	PhD	Applied Mathematics	Asst. Prof.	2010
Theresa	Friedman	PhD	Functional Analysis	Professor	2002
Darren	Gemoets	PhD	Statistics	Asst. Prof.	2013
Philip	Gustafson	PhD	Approximation Theory	Professor	1998
Philip	Kavanagh	PhD	Combinatorial Matrix Theory	Assoc. Prof.	1994
Rick	Ott	PhD	Statistics	Assoc. Prof.	2006
Erik	Packard	PhD	Number Theory	Assoc. Prof.	1996
Lori	Payne	PhD	Numerical Analysis	Professor	1986
Markus	Reitenbach	PhD	Discrete Mathematics	Assoc. Prof.	2006
Shawn	Robinson	PhD	Algebraic Geometry	Asst. Prof.	2011
Dan	Schultz-Ela	PhD	Geology/Math Education	Assoc. Prof.	2006
Zhong	Wu	PhD	Applied Mathematics	Professor	1989

Current Full-time Mathematics Faculty					
Name		**Degree**	**Expertise**	**Position**	**Year (Start)**
Christopher	Aquinto	MS	Applied Mathematics	Instructor	2012
Andrea	Barnard	MA	Mathematics Education	Instructor	2012
Marc	Fischer	MS	Mathematics	Instructor	2012
Max	McFarland	ME	Engineering	Instructor	2010
Molly	Ryan	MA	Mathematics Education/ Counseling	Instructor	2013
Risharra	Stulc	MA	Mathematics/Special Education	Instructor	2011
Wayn	Ward	MS	Physics	Instructor	2009

Current Part-time Temporary Mathematics Faculty					
Name		**Degree**	**Expertise**	**Position**	**Year (Start)**
Nathan	Atkinson	BS	Mathematics	Lecturer	2014
Cathy	Barkley	PhD	Math Education	Professor	1988
Robert	Beeken	PhD	Physics	Lecturer	2011
Jessie	Bollinger	MS	Engineering	Lecturer	2010
Gary	De Young	PhD	Philosophy of Mathematics	Lecturer	2014
Tim	Graus	MA	Applied Mathematics	Lecturer	2014
Cliff	Moore	MA	Industrial Arts/Education	Lecturer	2001
Joy	Potter	BS	Mathematics and Accounting and Education licensure	Lecturer	2014
Clarence	Ross	MA	Mathematics Education	Lecturer	2011
Chris	Tubbs	MA	Mathematics Education	Lecturer	2003

Faculty vitas can be found in Appendix C.

b. Financial Information

1) Total budget revenues and program expenditures.
The budget data for FY10 – FY14 are included in Appendix G. The data shows the gradual increase in PT and non/TT faculty over the years commensurate with the growth of the institution. In other categories (excluding salaries and benefits), the expenditures and budget have remained relatively the same over the period.

2) Ratio of expenditures/student credit hours.
The ratio of the mathematics program expenditures to student credit hour (SCH) are as follows:

	2008-09	2009-10	2010-2011	2011-12	2012-13	2013-14
Expenditures	**1,063,919.14**	**1,103,642.86**	**1,097,948.33**	**1,285040.32**	**1,455,726.14**	**1,724,516.06**
SCH	**9767**	**11,212**	**12,212**	**13,249**	**14,475**	**17568**
Cost/SCH	**$108.93**	**$98.43**	**$89.91**	**$96.99**	**$100.57**	**$98.60**

The cost per credit hour including allocations to fund Academic Services, Student Services, Institutional & Facilities are:

	2008-09	2009-10	2010-11	2011-12	2012-13
Math/Stats	**$274**	**$236**	**$302**	**$300**	**$297**
CMU	**$296**	**$258**	**$316**	**$308**	**$307**

For each of the years that data is available, the Math/Stats cost per credit hour is lower than the average CMU cost per credit hour.

c. Library Assessment

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

Strengths: The library collection has a good selection of resources across most of the subject areas in mathematics. Both monographs and journal articles are well represented. Further support is available though Prospector or interlibrary loan.

Weaknesses: A few monographic areas are weak, including the areas of ethnomathematics and business mathematics. Other areas such as functions of complex variables or differential equations lack recent materials.

Recommendations: Attention should be given to areas that appear weak and supportive materials should be ordered where appropriate. Existing funds should be adequate to purchase new materials.

d. Physical facilities

The physical campus of the institution has experienced numerous changes, additions, and improvements since the previous program review in 2008. As a result, many of the previous concerns about facilities have been addressed. In addition to describing the physical facilities available to the mathematics program, remaining shortcomings of those facilities and the impact on instructional effectiveness will be addressed.

Wubben Science Hall, the building which houses the mathematics faculty offices and where many of mathematics courses are taught, was remodeled in 2010. Mathematics courses are also taught in Houston Hall which was renovated in 2012 as well as in Escalante Hall which opened in Fall 2014.

Classrooms

Mathematics instruction is primarily done in Wubben Science Hall, although several classes are also taught in Houston Hall, and Escalante Hall. Class size ranges from between 4 and 25 students in most 200, 300 and 400 level mathematics classes and between 30 and 50 in lower level classes (for example MATH 110, MATH 113, MATH 151 and STAT 200). All classrooms used for mathematics instruction have whiteboards and integrated multi-media integrating computers, network and internet access, document cameras, DVD players, and projection screens.

Regardless of the level of mathematics being taught, classrooms for mathematics instruction must have ample board space for computations, proofs, or student work. To address previous concerns, the CSMS Department purchased and installed additional white boards in the classrooms throughout Wubben Science Hall after its renovation, and recently, extra white boards were added to some classrooms in Houston Hall. Thus, as of Fall 2014, many classrooms used for mathematics instruction offer adequate board space. However, visual access to that board space is blocked by the 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. It should be noted that for classes taught in a more interactive way where

students are engaged by getting all of them up to the boards to work problems the student's experience is diluted when there are 30 or more in the class.

Some of the rooms in the buildings listed above are not suitable for mathematics instruction. In Wubben Science, a few of the rooms suffer from being too wide for students seated on the far left and right to adequately see what is written on the opposite side of the board while in Escalante Hall, the smaller rooms are set up for discussion style courses with little board space.

However, with the opening of Escalante Hall, non-mathematics classes which do not require as much board use can be scheduled there so as not to displace mathematics classes from Wubben Science.
With the exception of three classrooms furnished with tables in Wubben Science Hall, the classrooms for mathematics instruction are equipped with desks. To allow for more opportunity for group work and classroom activities, more rooms with movable tables are preferred.

Students with disabilities have difficulty negotiating the physical layout in Wubben Science since several of the rooms and restrooms are not ADA compliant. Furthermore, desks designated for wheelchair-bound students in Wubben classrooms can be difficult to get to due to the density of desks in the room.

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 is otherwise similar to other mathematics classrooms with 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.

Temperature regulation problems persist in Wubben Science Hall, especially for classrooms on the south side of the building. However, a new air conditioning unit has been purchased for the building and the temperature problems are expected to be resolved after its installation.

It should be noted that classroom windows in Wubben Science 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.

Student Support

The Mathematics Projects Lab (MPL) is used officially to accommodate classes that require specialized mathematics software, to supply computer support for mathematics majors working on senior research projects, and to provide meeting space for department-funded Calculus Help Sessions and Math Club activities. The MPL offers a meeting place for our students where they can work independently or in small groups to develop their mathematical and computational skills. Having such a gathering place and workroom specifically designed for the mathematics majors 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 majors. 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.

It should be noted that the MPL is currently operating at its capacity.

There have been security issues related to the MPL, however with the current key-card access system, security concerns have lessened.

One concern about student access to the MPL for students working on projects that need the resources of the MPL or as a meeting place for group projects is the number of classes scheduled in the MPL. Since classes have priority scheduling a large number of classes in the MPL, especially in the late afternoon, displaces students that need the MPL's resources for their projects.

For students in math who do not have after-hours card access to the MPL, there is a small common work area outside the room with tables and a whiteboard. In addition, there are small common workspaces where students and faculty can gather in each of the three bays of offices that house the of mathematics faculty.

An issue that was not addressed with the renovation of Wubben Science is the lack of a secure, quiet area for students to make up exams or quizzes. The students find themselves taking these in the common area of the main office pod. This area is also used for office hours when there is an overflow of students and it is sometimes used for intradepartmental meetings and social gatherings. Thus, the space is a less than desirable environment for exam taking.

Faculty/Staff Needs

Faculty offices can accommodate at most 2 or 3 students at a time during office hours. For classes that have enrollments of 40 or more, this is problematic since the number of students needing help is, in general, directly proportional to the number of students enrolled. It should be noted that upper level classes that have smaller enrollments often have more office visits per class than lower level classes. Board space in these offices can only accommodate a short computation or a very short proof.

There are key carded doors to Wubben Hall allowing after-hours access to mathematics faculty offices. The heating and cooling problems that plague classrooms in Wubben, also plague faculty offices. The temperature in offices is inconsistent and unreliable during all seasons – too hot on warmer days and cold during the winter months.

There are no dedicated conference rooms or faculty lounge areas available in Wubben Science Hall.

Facilities for storage of instructional supplies are adequate, however there have been items stolen from the supply room and the Administrative Assistant's desk area. A key-card lock has recently been placed on the main office entry door and we hope to see improved security.

The Administrative Assistant's (AA) desk is in an open area of the main mathematics office,

WS 132. Non-departmental individuals have been seen going through the AA's desk drawers and cabinets when the AA was not present. Besides the security issues mentioned above, because the Administrative Assistant works with confidential student information the openness of the office and the resulting inability to secure records may be in conflict with the FERPA student privacy law. The AA often has to leave her desk area to tend to other needs in the department and this requires the constant and inefficient process of putting away and getting back out all files and papers being worked on throughout the day.

e. Instructional technology and equipment

Traditionally, equipment used in the teaching of mathematics has been simple. Blackboard and chalk comes to mind for many people. In recent years, however, the use of digital technology and computer-generated images (CGI) has greatly enhanced mathematical instruction. For example, CGI allows for easily manipulated graphs and other forms of visualization that allow for new perspectives in understanding equations, procedures and concepts. Students are therefore in a position to learn mathematics from several different vantage points (graphical and numerical), not just analyzing equations on paper.

A basic listing of instructional equipment includes:

(1) Supplies, such as white board markers, folders, etc.
(2) Document Cameras
(3) Classroom computer and computer projection unit.
(4) Internet capability
(5) Computer software, such as Maple and MATLAB (in some locations), Excel as well as open source software and applets such as Geogebra, R, FreeMat etc.
(6) Graphing Calculators
(7) Faculty computers/tablets

Generally, these items have been adequate for the mathematics and statistics programs.

Classrooms in Wubben Science have Maple, a computer algebra system, which can be used for demonstrations during class. However the Maple license is a concurrent license so there are a limited number of copies available for use at any given time and with mathematics courses being taught across campus, a full site license may be desirable.

We do not have licenses for Geometer's Sketchpad or SAS (statistical software). With some school districts using Geometer's Sketchpad, education majors would benefit from access, training, and use of the software. Also, with changes to the statistics program, there is potential for the future need of SAS.

The operating systems on faculty computers were updated in 2014 and computers are updated every 7-8 years. However, it is often the case that faculty find their computer/tablet increasingly unreliable in the last 4 to 2 years of that cycle due to the changes in operating systems and the software linked to it as newer technology is introduced. Faculty with special instructional tools such as Apple iPads need more frequent replacement as many apps no longer run on the older generation devices. Faculty computers also have access to the Maple software, but not to MATLAB.

As mentioned elsewhere in this document, senior seminar and other upper division mathematics students use the Mathematics Projects Lab (MPL) and its computers. The computers in the MPL are equipped with Maple, MATLAB, SPSS and other relevant software. However, the MATLAB software does not include toolkits such as the PDE toolkit that would be of great use for students, especially those working on senior projects in the field of study. The MPL has also been instrumental for applied courses such as Math 260 Differential Equations, Math 365 Mathematical Modeling, Math 396 Topics: Fourier Analysis. These courses also use the software mentioned above as well as others. Current software is critical for the knowledge and skill acquisition of our students, and software must be routinely updated for compatibility and serviceability purposes. Further expenses for the MPL include paper and printer-related costs, as well as white board pens. Computers were replaced by the mathematics department in 2011 and will need replacement every five years or so.

The math education classroom would benefit from enhanced technology such as a Smart Board and Short Throw Board, both for presentation and learning tools. Student presentations of projects and group work would make use of these devices. Such presentations align with teaching methods/expectations and prepare the students for their teaching careers. MathEd students need to learn how to use or be familiar with technology common in their future careers, such as a networked calculator response system (TI-Navigator), Smart Boards, and various software (e.g., Geometer's Sketchpad) and online resources.

f. Efficiencies in the program

In an effort to improve student success in college algebra for our weaker students, we have created a version of the course that meets five days a week instead of four. To do so efficiently, the fifth meeting is facilitated by a highly qualified mathematics major. Every attempt is made to use a mathematics education majors who benefit from the experience of working with a group of adult students in a classroom setting. This permits us to offer the extra meeting hour at no extra cost to the students enrolled in the course.

The mathematics program does an excellent job keeping our cost-per-credit hour as low as possible. In particular, our ratio of total expenditure to student credit hour was below the University average in 2008/09 through 2012/13. Data was not available for 2013/14.

We also have some efficiencies that we consider to be less than ideal. For example, a significant number of the 100-level mathematics and 200-level statistics courses are taught by non-tenure-track instructors. These courses make up a rather large percentage of the mathematics offering. In particular, during the 2013-14 AY, over half of the mathematics sections offered were non-calculus 100-level courses, the large majority of which were taught by non-tenure-track instructors. See Table G in Appendix D. These instructors typically have Master's degrees or, in some cases, Bachelor's degrees in mathematics or related fields. This allows tenured/tenure-track faculty members to cover upper-level courses (proof-based 200-level and up) where the background gained in earning a PhD in mathematics or statistics is essential for teaching those classes. Furthermore, the PhD research experience is invaluable when it comes to directing Senior Seminar research projects. It should be noted that the pay scale and benefits (if any) for adjunct faculty are lower than T/TT faculty. However, as mentioned earlier, the outside reviewer commented, "...hiring adjuncts should not be the first way to go as programs start losing credibility when the full-time [sic] to adjunct ratio decreases significantly."

Another efficiency is the Chair's and the Administrative Assistant's abilities to manage a program with a large number of students enrolled. Consider that for the 2013-14 AY a total of 3410 students enrolled in mathematics classes and 1039 enrolled in statistics classes. The number of problems that need to be resolved by the Chair is probably proportional to the number of students enrolled although data for this is not available due to the private nature of some of those conflicts.

5. Student Learning Outcomes and Assessments

a. Mathematics program student learning outcomes (SLOs)

In the 2012-2013 academic year all academic programs at Colorado Mesa University were asked to construct new program-specific student learning outcomes (SLOs) and plans for assessing them in light of the following, new university-wide SLOs:

CMU associates graduates will be able to

A1 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. (applied learning; specialized knowledge)

A2 use program-level mathematical concepts and methods to understand, analyze and explain issues in quantitative terms. (intellectual skills -- quantitative fluency)

A3 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)

A4 identify and gather the information/data relevant to the essential question, issue and/or problem and develop informed conclusions. (intellectual skills -- critical thinking)

CMU baccalaureate graduates will be able to:

B1 construct a summative project, paper or practice-based performance that draws on current research, scholarship, and/or techniques, and specialized knowledge in the discipline. (applied learning; specialized knowledge)

B2 analyze data critically, reason logically and apply quantitative methods correctly to develop appropriate conclusions. (intellectual skills -- quantitative fluency)

B3 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)

B4 identify assumptions, evaluate hypotheses or alternate views, articulate implications and formulate conclusions. (intellectual skills -- critical thinking)

New SLOs and assessment plans for mathematics, mathematics secondary education, and statistics were written in the context of the CMU baccalaureate SLOs and are included here in Appendix E as Tables 5.1, 5.2 and 5.3, respectively. Tables 5.4, 5.5 and 5.6 map these SLOs to the courses required for majors in mathematics, secondary mathematics education, and the statistics concentration, respectively.

b. Direct and indirect metrics of assessments of SLOs

We implemented the planned assessments in Statistics 200, Math 253, and Math 325 in the spring semester of 2014. These assessments are or will be repeated in the fall 2014 semester. After a review of the results, we will revise and implement our full assessment plan in the spring 2015 semester.

The majority of CMU students satisfy the general mathematics requirement by taking Math 110 or 113. The university is in the process of revising SLOs and rubrics for essential learning courses (formerly called general education), and the mathematics program is developing assessments of these essential learning SLOs within these two classes. University faculty will first review the SLOs, rubrics, and assessments in early November, 2014, and we expect to finalize an assessment plan in spring 2015.
For more details see Appendix E.

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

Results of Assessment and Examples of Student Successes

Due to the recent implementation of our SLO assessments, we do not have enough data to draw any conclusions about the effectiveness of our programs. However, there is anecdotal evidence of the effectiveness of the CMU mathematics program. Four CMU students have completed NSF REU projects in the last three summers. At least three CMU graduates have entered graduate programs in mathematics or statistics. Two recent graduates (2013 and 2014) gained immediate employment in management-track jobs in the financial and insurance sectors. Another (2013) gained immediate employment at a non-profit that prioritizes and manages waiting lists for organ transplants.

d. Refinements of SLOs and associated assessments and metrics

As mentioned earlier, SLOs were initiated in the Spring of 2014 and at this point have not had enough time to generate enough data for analysis. However, refinements of the assessments based on some kind of metrics will take place once there is enough data for reliable analysis. These refinements will adhere to the values, goals and spirit of the Program Mission Statement and the Vision Statement.

e. Other assessments utilized by the program

During this Program Review cycle, three major assessments of student learning for majors were Senior Seminar research projects, the Major Field Achievement Test or MFT, and the PLACE or PRAXIS exams.

Senior Seminar Assessment

All students majoring in mathematics or mathematics with a concentration in statistics are required to take the MATH 484/494 Senior Seminar sequence. At the end of Senior Seminar II, each student submits a final paper on his/her research project, and gives a 20-minute presentation during Mathematics Colloquium. 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 colloquium (typically around 5-10 faculty). From spring 2009 through spring 2014, 49 students completed the Senior Seminar course sequence. Of those students, 41 (83.7%) earned 80% or higher on their final paper and 44 (89.8%) earned 80% or higher on their final presentation. The rubric for the Senior Seminar research papers is based on a 30 point scale that can be found in Appendix E along with the rubric for the presentation portion that is based on a 20 point assessment.

Major Field Achievement Test

Assessment plans have varied over the years, but always include the Major Field Assessment Test (MFT). All students completing the B.S. in Mathematics, regardless of concentration, take this nationally recognized test during their senior year. The Mathematics students typically do not have a strong incentive to prepare for the MFAT or may not even take it seriously, but it is still an indicator for student academic achievement.

MFT scores in mathematics range from 120 to 200. For several years, the mathematics program assessment criterion for "success" has been that 75% of our students score 140 or higher on the MFT exam. For the years covered by this program review, 82.9% of our students scored 140 or higher. In fact, 88.6% scored 139 or higher. A yearly breakdown of the percentages of students scoring 140 or higher is given in the following table.

Year	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
% 140 or above	93%	87.5%	78%	100%	73.3%	71.4%

It should be pointed out that while the desired success rate of 75% was missed in 2012/13 and 2013/14, the actual scores for these years show that several students scored 139. That said, 86.7% of the students scored 139 or higher in 2012/13 while 85.7% of the students scored 139 or higher in 2013/14. 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	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Individual Student Scores	178+	199+	169+	181+	167+	170*
	175+	193+	155+	172+	167+	164^
	169^	169+	149+	166+	166+	161+
	166^	166+	149*	161+	164^	161^
	166^	149*	146*	158+	164^	161^
	161+	143*	143*	155+	158+	154+
	161^	140+	140*	149+	148*	148*
	158*	137+	134*	143+	145+	148^
	155+		131*	143+	145*	148^
	155^				145^	145+
	155^				143+	139*
	152*				139+	139*
	146*				139^	133^
	143^				136+	123^
	137*				133+	
Mean	158.5	162	146.2	158.7	150.6	149.6

* Indicates Mathematics with Secondary Education Concentration
^ Indicates Mathematics with Statistics Concentrations
+ Indicates (pure) Mathematics

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

From 2008/09 to 2013/14, the mean MFT score for all CMU mathematics majors is 153.9. For that same time period, the mean MFT scores by concentration are 157.6 for mathematics students concentrating in pure mathematics, 152.5 for mathematics students concentrating in statistics and 144.1 for mathematics students concentrating in secondary education.

National statistics from the Educational Testing Service (ETS) for the MFT in mathematics can be found on the ETS website (www.ets.org). The table below is from the 2014 ETS 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.

Institutional Means Total Score Distribution

Number of Institutions	Mean of Means	Median	Standard Deviation
221	155.1	154	9.3

Our overall institutional mean (153.9) is close to the mean of means (155.1) of other institutions using the exam. The mean for pure mathematics students (157.6) is slightly higher while our institutional means for students majoring in statistics (152.5) and secondary education (144.1) are lower. Students concentrating in statistics or secondary education take a different set of (slightly less rigorous) mathematics courses than pure math majors and so the lower mean scores are not surprising.

The assessment indicators for the mathematics MFT exam are Calculus, Algebra, Routine, Non-routine and Applied. The mean percents correct for CMU mathematics students on the assessment indicators are 31.5, 34, 32.5, 25.5 and 32, respectively. These results compare favorably with the mean of mean percents correct for the assessment indicators for other institutions using the MFT mathematics exam. Those mean of mean percents correct are 30.7, 33.3, 31.5, 26.2, 34.4, respectively, and can be found in the ETS Comparative Data Guide. It should be noted that the mean percents for CMU students in this paragraph are averages of mean percents for two different forms of the MFT exam.

PLACE and PRAXIS exams

Students pursuing teaching licensure, either elementary or secondary, must take the standardized PLACE 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.

Both PRAXIS II and PLACE scores are available for the mathematics majors who concentrated in secondary education. Of the 30 students who took the PLACE test in 2008 or later, all but three passed. However, of the nine students who took the PRAXIS II exam in the same time period, four failed. One of the students who failed the PRAIXIS II subsequently passed the PLACE test. The gross disparity in pass rates between the exams stems from the anomalously high pass score that Colorado set for the PRAXIS II exam (until fall of 2013). 37 states accepted that exam, and Colorado required the highest passing score, 156, of all of them. The next highest score was 147, whereas the average required passing score was 134 and Arkansas only required 116. Many of our students who failed the PRAXIS II exam in Colorado would have passed it in many other states. In fall of 2013, Colorado adopted a different PRAXIS II test for mathematics content and set a cut score the same as many other states, which is also the score recommended by ETS, the creator of the assessment. None of our students have taken the new PRAXIS II test.

6. Future Program Plans

a. Vision for the mathematics program

Vision Statement: *To provide students the best possible undergraduate education in mathematics by facilitating the acquisition of a conceptual understanding of the nature and structure of mathematics, its procedures and applications*

b. Strengths and challenges facing the program

In the last program review, the external reviewer described our curriculum as a key strength and we believe that to remain true. As mentioned in Section 1G, the mathematics program is rigorous and offers many curricular opportunities that are not typically found in mathematics programs at schools of our size and with our mission. For example, we have a weekly (1-credit) mathematics seminar that has been active for over 18 years. In this seminar students gain valuable exposure to topics not normally encountered in their coursework including many applications of mathematics and computer science. Seminar talks are given by faculty and students, and also by individuals outside CMU who apply mathematics in their careers. Due to the rotational nature of our curriculum, each semester, in addition to offering upper level courses required for our degrees, we also offer multiple (often two or three) upper level mathematics elective or topics courses such as Fourier Analysis, Topology, Mathematical Logic, Complex Analysis, Cryptography, Numerical Analysis, and Algebraic Geometry. We are fortunate to make these offerings despite our relatively small class sizes and do so by using a two-year course rotation. For example, Topology, Complex Analysis, Mathematical Logic and Linear Algebra II, are offered every fourth semester. Students in mathematics and statistics concentrations take a year-long senior seminar capstone course. During the second semester of the senior seminar sequence, students complete an in-depth mathematical or statistical research experience under the guidance of a faculty mentor, exhibiting the skills and knowledge obtained in their previous mathematics and/or statistics courses including the research, writing and presentation skills developed during the first part of that course sequence. Students in our Statistics concentration often do consulting projects in the community as part of their research for this course. Students in our secondary education concentration take a strong program of coursework aligned with national educational-organization standards that far exceed the state requirements for secondary licensure. These students spend an unusually large amount of time as interns in local schools, a benefit both to them and to the community. They are required to spend 180 field hours in the schools as pre-interns, and 600 hours as interns (student teachers), where they are expected to attend and fulfill the same expectations as licensed teachers.

The mathematics program has a dedicated and experienced group of faculty members who make teaching their first priority. All faculty members teaching upper level courses are tenured or on tenure-track and have earned Ph.D's. *We work with students to build relationships and to foster a strong sense of community within our program.* There is a thriving Math Club that includes students from several different majors. 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 which recently has been drawing about 150 students from regional high schools who learn interesting applications of mathematics and participate in mathematical games and contests. The event serves as a recruitment tool for both the university and the mathematics program. Additionally, the Math Club raises money to provide funding for students to attend national conferences and present their research through a variety of fundraisers held during the year. The Mathematics Honor Society, Kappa Mu Epsilon, also draws its membership from many different majors with approximately 8-10 new inductees each year. We also typically have about 5-10 mathematics students who participate in the annual Student Showcase held here at Colorado Mesa University each spring. Additionally, there are ample opportunities within our department for our students to serve as teaching assistants, study group leaders, and tutors. These opportunities are especially important for future teachers and for students planning to seek graduate teaching assistant positions.

c. Trends in the discipline that may impact the program

One of the most significant trends in mathematics is to increase student understanding of how mathematics fits into other disciplines. In October 2013, Willian J. Satzer wrote a review of *The Mathematical Sciences in 2025* for the Mathematical Association of America. Satzer points out that the book is a report of the findings of a committee commissioned by the National Academy of Sciences whose task was to examine the mathematical sciences and make recommendations for how the discipline needs to evolve to best serve the United States by 2025. According to Satzer, the committee recommends *"increasing the number of mathematical scientists who are knowledgeable across a broad range of disciplines beyond their own area of expertise, capable of communicating well with researchers in other disciplines, cognizant of the role of the mathematical sciences in the wider world of science, engineering, medicine, defense and business, and competent with computation."*

In response to this push toward interdisciplinary awareness, we have begun to investigate the possible addition of an interdisciplinary applied mathematics concentration. More information can be found in the following.

d. 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. While much of our program is working very well, we find that there are a few changes that we believe would strengthen our program and better position our students for success in the current career climate. Those changes include:

- investigating the possibility of a concentration in applied mathematics
- investigating the possibility of a freshman/sophomore seminar in mathematics
- revising the Senior Seminar sequence
- investigate the possibility of creating a pedagogical content knowledge course for students concentrating in (secondary) mathematics education
- investigate the possibility of creating a course to meet the needs of post-baccalaureate students seeking elementary teaching certification
- investigate options for helping education students study for the Praxis I test.

Timelines for the potential implementation of some of the changes listed above are located in Appendix F.

Implementing a concentration in applied mathematics directly reflects the trends in the discipline discussed briefly in the previous section. We believe that the addition of a concentration in applied mathematics would provide our students with the background required to fill an ever-growing need in industry. While such an addition would require some reorganization and partnerships with other disciplines, we do not believe that it would require a substantial number of new courses.

Several designs have been discussed for a Freshman/Sophomore seminar in mathematics. One of the primary goals of this seminar course would be to introduce students to some of the ideas

in higher level mathematics while they are still taking Calculus I. A secondary goal would be to introduce students to possible career paths open to student who major in mathematics.

While the current Senior Seminar course sequence works very well for our stronger students, it is a difficult task for weaker students with their faculty mentors to get through their research projects. This has led us to question whether we might be able to offer multiple options for completing the senior capstone experience that would still meet our goals for the course while providing a more appropriate and useful experience for students who are not interested in research. Thus far, we have met to discuss some ideas, but we are still in the early planning stage for such revisions.

Students concentrating in secondary education currently take mathematics content courses and pure education courses with only a two-credit methods bridge course (EDUC 497c). Voluminous education research emphasizes the importance of not just mathematical content knowledge, but such knowledge acquired in a form appropriate for teaching at the secondary level (termed "pedagogical content knowledge", "mathematical knowledge for teaching" or "semantic ascent"). For example, a vast gulf separates knowledge of factoring from knowledge of how to show and describe the reasons for the procedure and strategies to teach the concepts from multiple age-appropriate approaches. A new (or modified) course could help bridge the gap by emphasizing deep understanding of some fundamental mathematics on a more conceptual level aimed at secondary educators.

Post-baccalaureate students seeking elementary teaching certification commonly need a single mathematics content course. None of the three courses in our normal elementary education mathematics sequence is really appropriate. A new course that captured the fundamentals of elementary mathematics concepts, as well as some work in problem solving and standards, would much better serve the post-baccalaureate students.

e. Program's challenges and potential resources needed to address them

We believe that all proof-based mathematics courses at the 200 level and above as well as all upper-level statistics courses should be taught by T/TT faculty with PhDs in mathematics or statistics. In addition, instructors without terminal degrees teaching the calculus sequence courses should be encouraged to have conversations with T/TT mathematics faculty if questions arise about the connections between those classes and the upper level curriculum. The current number of faculty with PhDs in mathematics or statistics can just meet the demand for courses at the calculus or higher level but it is inadequate to simultaneously cover the number of sections of MATH 113, College Algebra, and MATH 110, College Mathematics, needed each semester. As a result, most of those courses are taught by adjunct faculty. Many of these instructors are new to teaching at the college-level and almost none of them teach any higher level courses. Determining what topics should be emphasized, appropriate assessments, and other course details can be very challenging for instructors who do not teach any of the subsequent coursework and often results in inconsistency across different sections of the same course. It is impossible for the Chair of CSMS to personally supervise, visit classes, and mentor all adjunct faculty due to the number of adjuncts and the wide range of class times and locations of classes in addition to the other responsibilities of the Chair. A possible solution would be to have the MATH 113 and MATH 110 courses supervised by a tenured or tenure-track faculty member who would require release time in order to meet weekly with the instructors, to help to create

and align assessments, to regularly visit classes and to deal with other issues.

There is also great need for a tenure/tenure-track line for Mathematics Education. This current mathematics education professor is responsible for teaching six different courses specifically for elementary education majors with mathematics as their emphasis and also sometimes the methods course (EDUC 497c) for students with a secondary education concentration. These seven courses require specific expertise and experience in mathematics education, which is not generally available from other department faculty. In addition, the same professor is responsible for advising most of the elementary and secondary education students. A mathematics education instructor shares the teaching load for the lower-level courses, but significant advising is not an expectation for that position. The addition of new courses in the education track (see Section 6d) will not be possible without another mathematics education faculty member with the expertise and commitment levels appropriate for a tenure-track position.

The problems mentioned above are due to the success in recruiting students to attend CMU to the point where the number of students enrolled at CMU has exceeded the ability of T/TT faculty to cover all mathematics classes taught at the 100-level while still delivering personalized, focused mentoring and instruction at the 200-level and above classes for its majors. Currently, the "adjunct" solution to the problem is adequate but finding qualified instructors on the Western Slope that are willing to work hard for low pay can be difficult.

As mentioned earlier, getting classes scheduled into rooms that are appropriate for mathematics courses remains a problem. Significant board space, room for students to work in groups at those boards and good line-of-sight are necessary for proper instruction.

Appendix A

Program Goals and Objectives

Appendix A:

Mathematics Program Goal and Objectives
Mathematics Major
Goal: Provide students with an excellent liberal-arts education in mathematics
Objectives:

- Common BS Degree Objectives (see below)
- Provide students with a deep understanding in at least one area of mathematics.

Mathematics with Concentration in Secondary Education
Goal: Provide students with the breadth of mathematics content and conceptual understanding necessary to be successful high-school teachers.
Objectives:

- Common BS Degree Objectives (see below)
- Expose future teachers to the logical and historical development of mathematical ideas.
- Meet the requirements of state and national standards and provide the range of advanced coursework required by local, state, and national accrediting agencies.

Mathematics with Concentration in Statistics
Goal: Provide students with more specialized knowledge in statistics.
Objectives:

- Common BS Degree Objectives (see below)
- Develop an understanding of statistical reasoning, necessary assumptions and correct use of statistical procedures.

Common Objectives for the Three BS Degrees

- Develop problem-solving skills.
- Provide students with an understanding of the nature of proof.
- Provide students with powerful logical and critical thinking skills.
- Provide students with a broad general understanding of mathematics.
- Develop independent learning skills.
- Develop persistence and skill in exploration, conjecture, and generalization.
- Develop skills to implement and use appropriate technology, and to understand its limitations.
- Develop professional skills: oral and written mathematical communication skills, cooperative work skills, and professional deportment.
- Increase the number of people proficient in the mathematical sciences to address the crucial shortage of such people nationwide.

Mathematics Minor
Goal: Provide students an exposure to the ideas, principles and methods in mathematics.
Objectives:

- Develop problem-solving skills.
- Expose students to the nature of proof.
- Provide students with logical and critical thinking skills.

- Provide students with a general understanding of mathematics.
- Develop skills to implement and use technology, and to understand its limitations.
- Increase the number of people proficient in the mathematical sciences to address the crucial shortage of people with such skills nationwide.

Statistics Minor
Goal: Provide students an exposure to the ideas, principles and methods in statistics.
Objectives:

- Develop problem-solving skills.
- Provide students with logical- and critical-thinking skills.
- Develop an understanding of statistical reasoning, necessary assumptions and correct use of statistical procedures.

Associate Degree in Mathematics
Goal 1: Provide students with a reasonable exposure to foundational college-level mathematics.
Objectives:

- Same as those for the Mathematics minor

Goal 2: Prepare students for matriculation into a baccalaureate program.
Objectives:

- Provide sufficient coursework so that students will be able to complete a baccalaureate degree with only 60 additional hours of coursework.

Service to Other Disciplines: Liberal-Arts Majors with Elementary- Education Concentration in Mathematics
Goal: To acquire a coherent fundamental understanding of mathematics concepts in a way that reflects the students' future employment, where they will teach mathematics knowledgeably, have confidence in their abilities, and be empowered to present and discuss mathematics as well as answer a wide range of student questions.
Objectives:

- Common Service Objectives (see below)
- Provide students with a broad general understanding of mathematics.
- Develop in students a deep and coherent understanding of the mathematical principles underlying elementary curricula.
- Develop both oral and written expository skills appropriate for effective communication as teachers.
- Develop professional skills such as cooperative work skills and professional deportment.
- Provide experience in mathematics of sufficient depth to have a real appreciation of the necessity for rigor and precision.
- Grow the program toward meeting the crucial nationwide shortage of mathematically well-qualified teachers.
- Increase the number of graduates who can become math specialists and lead teachers in elementary schools.

Service to Other Disciplines: General Education
Goal: Support the liberal-arts mission of CMU by developing students' proficiency in elementary

mathematics, logical-thinking and critical-reasoning skills for all courses of study.

Objectives:

- Common Service Objectives (see below)
- Provide students in other disciplines with the necessary mathematics background for their major coursework.

Common Objectives for Service to Other Disciplines

- Develop problem-solving skills.
- Develop mathematical language skills.
- Provide students with logical- and critical-thinking skills
- Develop skills to implement and use technology, and to understand its limitation.

The goals and objectives of the mathematics program, as stated above, reflect its dual purpose within the institution: support of the mathematics degree programs and support of other programs at CMU.

Within the mathematics program, students may choose to pursue a concentration in mathematics, statistics, or secondary-education. The curriculum for each is designed to help the mathematics program meet its goals, as detailed below.

Develop problem-solving skills. Problem solving is inherent in every mathematics course, and hence the skills to solve problems are cultivated from the first mathematics course a student takes through to the last upper-level course completed. For example, in the calculus sequence students use definitions of key concepts and understand and apply theorems and techniques towards the solution of problems. Mastery of problem-solving skills in this context is developed and assessed regularly by assignments and exams.

Provide students with an understanding of the nature of proof, and provide students with powerful logical- and critical-thinking skills. All students majoring in mathematics take Introduction to Advanced Mathematics (MATH 240). In this course, students are immersed in a rigorous mathematical proof-writing experience. Students must develop strong critical-thinking skills in this course, where logical and sequential construction of ideas and precise communication is essential. These skills are foundational to subsequent upper level courses, such as Abstract Algebra (MATH 490-491) and Introduction to Real Analysis (MATH 452-453), in which rigorous abstract reasoning and proof writing skills are developed even further.

Provide students with a broad general understanding of mathematics. These objectives are met by the curricular design of the mathematics program. Students in all three mathematics BS degree programs are required to take core courses representing a broad overview of mathematics.

Develop independent learning skills. Students progressing through the mathematics major program are required to take courses that increasingly foster independent learning skills. For example, students in the mathematics program typically start with a three-semester calculus sequence, which is largely computational. Students then take Introduction to Advanced Mathematics (MATH 240), a very conceptual course with an emphasis on elementary proof writing skills. This course is followed by several upper-division mathematics courses including Abstract Algebra (MATH 490 and MATH 491) and/or Introduction to Real Analysis (MATH 452 and MATH 453) both of which are proof-based and rigorously conceptual, requiring clear understanding of abstract concepts and precision in communication. The major culminates in the Senior Seminar sequence (MATH 484 and MATH

494). These courses provide students with a capstone experience focusing on the development of research and communication skills. Students work with a faculty mentor to investigate, in-depth, a topic of their choosing and are required to write a paper and give a presentation to the mathematics faculty on their results. To successfully complete such a program, it is crucial that students develop independent-learning skills, which in turn requires dedicated mathematics faculty providing excellent guidance and appropriate assistance to ensure proper development of student skills.

Develop persistence and skill in exploration, conjecture, and generalization. This objective is met in all mathematics courses offered in the program. Like problem-solving skills, persistence and skill in exploration, conjecture and generalization is inherent in the college mathematical experience. Students in calculus are frequently challenged by problems and projects embodying these objectives. Students in Geometries (MATH 386) work through geometrical constructions using Geometer's Sketchpad software in order to explore, formulate and test conjectures. Students in the proof-based upper-level core courses are continually challenged to make conjectures and generalizations. Instructor-guided classroom discussions center on cultivation of these essential skills in our majors.

Develop skills to implement and use technology, and to understand its limitations. Nearly all mathematics faculty use some form of technology in some or all of their courses. It is also a shared belief that technology should be used only when appropriate and that students need to understand the limitations of technology in order to use it effectively. Further, the mathematics faculty generally believes that technology should be used as a computational tool or as an aid to investigation and understanding. Technology use is, therefore, secondary to the development of necessary skills and reasoning in the mathematics curriculum. The most common form of technology used in mathematics coursework is a graphing calculator. A singular advantage of calculators over computers is that they enable classroom use of technology without the need for computer labs. A graphing calculator performs all of the traditional functions of a classic scientific calculator; however, it is the graphing and data analysis features that make it particularly useful in mathematics, statistics and mathematics education. Other forms of instructional technology are often used (as appropriate), such as SPSS, Geometer's Sketchpad, Excel, Maple, and the internet, as well as text-editing and presentation tools, such as MS Word and PowerPoint. All forms of instructional technology are used in a way that is consistent with the mathematics faculty view on appropriate use of technology as described above.

Develop professional skills: oral and written mathematical-communication skills, cooperative-work skills, and professional deportment. Many of the courses offered in the mathematics program incorporate extensive individual assignments as well as group work and presentations. These basic activities help students develop responsibility and accountability, which in turn cultivate professional deportment. A primary goal for MATH 484 (Senior Seminar I) is to obtain proficiency in the skills required to conduct mathematical research. In that course students become adept at using library and online resources as well as using a mathematics typesetting tool such as LaTeX or Word Equation Editor. Additionally, students learn how to read mathematics research papers and how to disseminate the information they learn in written reports as well as oral presentations. MATH 494 (Senior Seminar II) serves as the capstone course for the mathematics major. Students complete an in-depth mathematical research experience under the guidance of their assigned mentor, exhibiting the skills and knowledge obtained in their previous mathematics courses including the research skills developed in MATH 484. Students write a paper describing their semester-long work and results and also give a 20-minute presentation summarizing their project in our Mathematics Colloquium.

Increase the number of people proficient in the mathematical sciences to address the crucial shortage of such graduates nationwide. The mathematics faculty is active in recruiting and retaining majors. Some specific steps that the faculty has taken include creating, sponsoring and mentoring the Math Club, sponsoring a local chapter of Kappa Mu Epsilon (a national mathematics honor society) and mentoring and assisting students through difficult course work. Faculty members also participate in SOAR (Student Orientation Advising and Registration) and Scholar's Day, working with potential, as well as admitted, freshmen to ensure that they are starting with proper courses.

Additional Mathematics Objectives: In addition to meeting the general objectives above, the mathematics major is designed to provide students with a deep understanding in at least one area of mathematics. Majors pursuing a BS degree in mathematics choose a year-long sequence in either abstract algebra or real analysis. In addition, Senior Seminar II (MATH 494) is a course that requires mathematics majors to complete an in-depth study of a mathematical topic.

Additional Secondary Education Objectives: In addition to meeting the general objectives above, the concentration in secondary education is designed to achieve the following objectives: (1) provide professional skills in methods and content to pre-service teachers and (2) expose future teachers to the logical and historical development of mathematical ideas. The secondary-education students receive a solid background in mathematics content from the strong mathematics program discussed in previous paragraphs. The secondary-education students also take Methods of Teaching Secondary Mathematics (EDUC 497C, taught by mathematics faculty) and History of Mathematics (MATH 380). In EDUC 497C, pre-service teacher candidates develop professional skills in method and content, as well as participating in extensive field work in a local school district. In MATH 380, students examine the logical and historical development of mathematical ideas at great length. Further, these students are exposed to the logical development of mathematical ideas as well as historical perspectives in the mathematics core requirements.

Additional Statistics Objectives: In addition to meeting the general objectives above, the concentration in statistics is designed to develop an understanding of statistical reasoning, necessary assumptions and correct use of statistical procedures. In particular, it is designed to (1) provide students with a large array of statistical analysis procedures, (2) develop an understanding of the necessary assumptions and correct use of statistical procedures, (3) provide students with an understanding of statistical reasoning and of measures of uncertainty, (4) develop skills in the use of statistics software and (5) develop an understanding of the summarization of statistical findings and necessary communication skills, especially when interacting with other professionals. These objectives are addressed in each of the courses leading to the degree in this concentration. For example, students in these courses get an introduction to a wide spectrum of basic statistical procedures and the necessary assumptions for their appropriate use. Students also learn how to use graphing calculators and MSExcel Data Analysis Toll Pack to enter and plot data, as well as to analyze data using elementary statistical procedures. Further, students combine these two aspects of their coursework by writing brief summaries of their analyses in assignments and projects. In upper division coursework, students continue to learn more sophisticated statistical methods, such as design of experiments, sampling techniques and statistical modeling of data, as well as using higher levels of mathematics and gaining expertise in software programs such as SPLUS and R.

Appendix B

Chronology of Mathematics Program

Appendix B: Chronology of Mathematics Program

Below is a chronology of the mathematics program at Colorado Mesa University from the time that the institution became a baccalaureate degree granting institution to the present.

1974 Mesa College was authorized by the Colorado Legislature to begin offering baccalaureate degrees. The Division of Computer Science, Mathematics and Engineering began offering a Bachelor of Science Degree in Computer Science with 11 full-time faculty members, 9 in mathematics. The degree required coursework in the areas of mathematics, computer science and statistics. This coursework included 12 quarter courses in mathematics, 6 of which were at the upper division level.

1978 An agreement was reached with the University of Northern Colorado (UNC) for Mesa College students to become certified to teach mathematics at the secondary level. Three new courses were added: History of Mathematics, Modern Geometry I, and Modern Geometry II. This agreement enabled students to graduate with a B.S. degree in Computer Science, spend one quarter on the UNC campus taking more education courses, and then student teach the next quarter to receive certification for teaching at the secondary level. Mesa College also changed to the semester system with appropriate changes in the course offerings. The division of Computer Science, Mathematics and Engineering was renamed the Department of Computer Science, Mathematics and Engineering. There were 10 upper division course offerings at the time.

1980 The degree was changed to a Bachelor of Science in Physical Science and Mathematics. It required an emphasis in Computer Science, Mathematics, or Computer Science and Applied Mathematics.

1982 An arrangement, called Mesa/Metro Consortium for Teacher Education, enabled Metropolitan State College to deliver the necessary education courses on the Mesa College campus and to certify teachers at both the elementary and secondary level.

1983 A Secondary Mathematics teaching emphasis area under the B.S. in Physical Science and Mathematics degree program with certification from Metropolitan State College was introduced.

1989 Mesa College became Mesa State College via a legislative name change. There were 11 upper division course offerings at the time.

1990 The use of graphing calculators in the mathematics classes was introduced.

1991 Mesa State College received authorization to offer its own education courses and to certify prospective teachers.

1993 The names of the degrees offered by the Department of Computer Science, Mathematics and Engineering were changed to Bachelor of Science in Mathematics and Bachelor of Science in Computer Science. Concentrations in Elementary Mathematics Teaching, Secondary Mathematics Teaching, and Statistics became options for students seeking a B.S. degree in Mathematics. The Concentration in Elementary Mathematics Teaching was a new and unique program brought about by state legislation. This law required that prospective elementary teachers have a degree in an academic area.

1993 Mesa State College enacted the graduation requirement that every baccalaureate candidate

must complete at least one college level mathematics course. There were 15 upper division course offerings at the time.

1994 The Department of Computer Science, Mathematics and Engineering bought a site license for the Maple computer algebra system for instructional supplementation. The department also bought site licenses for MINITAB and SAS for its instructional program in the Statistics concentration.

1995 The department was renamed the Department of Computer Science, Mathematics and Statistics. This name change reflected the fact that the Associate Degree in Engineering was transferred to the Department of Physical and Environmental Sciences.

1997 The Department of Computer Science, Mathematics and Statistics had 18 tenured or tenure-track mathematics faculty and offered 18 courses at the upper division level.

1998 The revisions recommended in the 1997 Mathematics Program Review were approved and implemented. The program modifications became official in the 1999-2000 catalog. This updated program was designed to align with the recent guidelines of the Committee on Undergraduate Programs in Mathematics of the Mathematics Association of America. Key components of the program were:

- a common core of courses fundamental to the mathematics major
- an in-depth experience in one major area of mathematics
- a selection of elective courses, allowing the student, in consultation with his or her departmental advisor, to tailor a program consistent with a specific career goal
- the integration of computer technology into all applicable parts of the program
- a senior level capstone course, requiring each student to write a paper or give a talk integrating the knowledge obtained in previous courses. This course was the program's first attempt to introduce the emerging concept of undergraduate research in mathematics, which is very different in nature from undergraduate research in the sciences

2000 Three new courses were introduced.

- Honors Mathematics (MATH 149, 3 credit hours) was introduced to support the honors general-education program.
- Introduction to Computer Algebra Systems (MATH 147, 1 credit hour) was added in place of the computer laboratory component of the Calculus I course. This change took place because it became impossible to schedule the computer laboratory component in Calculus I due to limited access to computer labs and the fact that the typical class size of Calculus I exceeded the lab capacity (24 seats).
- Mathematics Colloquium (MATH 394, 1 credit hour) was designed to provide a weekly meeting of faculty and students. Each week a student, faculty member or guest speaker gives a talk on theoretical mathematics or an application of mathematics.

2001 The mathematics major with concentration in elementary education was eliminated (along with all other elementary education programs) as a result of new state legislation. It was replaced by the new Liberal-arts Degree with concentrations in various academic areas, including mathematics. Mathematics for Elementary Teachers (MATH 301, 3 credit hours) was added as a requirement for

all students seeking licensure as elementary teachers in the Liberal-arts program.

2001 A new concentration, Computational Science, was offered within the Mathematics degree program. This concentration was designed to prepare students for the expanding career area incorporating mathematics and evolving computer technology. Computational Linear Algebra (MATH 225, 3 credit hours), Computational Abstract Algebra (MATH 425, 3 credit hours), and Mathematical Logic (MATH 430, 3 credit hours) were added to support this concentration. Mathematical Logic was also added to the approved list of courses for the mathematics major.

2001 Structured Research (MATH 397, 1-4 credit hours) was added in all subject areas in the School of Natural Sciences and Mathematics (except engineering which does not have upper division courses). Its purpose was to clearly identify undergraduate research as opposed to the former catch-all category of Independent Study. Typically, Structured Research and Independent Study courses are non-remunerated teaching overloads for faculty.

2002 Ethnomathematics (MATH 340, 3 credit hours) was added. This course was designed as an elective for prospective mathematics teachers. It addresses cultural differences in the perception and learning of mathematical concepts.

2003 The Associate of Science degree in Engineering was eliminated. This removed some students from the three-semester Calculus sequence and Differential Equations.

2005 Senior Seminar, the capstone course for mathematics majors, was expanded from a 1-credit course to a two-semester sequence for a total of four credit hours. In the first semester students learn to use library facilities and online research resources, how to use TeX, the mathematical typesetting program, and Maple, the symbolic computation program, and how to make presentations. In the second semester each student works with a faculty member, studying a topic not normally covered in the undergraduate curriculum. The student writes a paper and gives a presentation at the Mathematics Colloquium on his or her research.

2006 A Minor in Statistics was established.

2006 The Advanced Calculus sequence (MATH 452, 453) was renamed Real Analysis I and II to better reflect the content of the courses. A new course, Advanced Calculus (MATH 352) was added. This course consists of a thorough treatment of the calculus of one real variable. It is required for majors with the concentration in secondary teaching. The change was made since it is now common for secondary teachers to teach calculus, and while the introductory calculus sequence does not have the depth to prepare teachers, real analysis has too much abstraction to adequately supplement these courses.

2006 The Concentration in Computational Science was eliminated since the program did not have enough resources to support the limited number of students pursuing this concentration.

2006 Three new tenure-track faculty members were hired, one in each of the areas of pure mathematics, mathematics education and statistics. These hires filled vacancies caused by retirement or resignation.

2006 The Mathematics Project Laboratory (MPL) was established. The lab gives mathematics majors a place to work individually or in groups on class projects. The MPL has computers with

specialized software installed. Having a dedicated lab like this reduces the cost of software site licenses.

2006 A new site license for the Maple software package was obtained. This was the first upgrade in over ten years.

2006 Control of all remedial mathematics courses was moved from the Department of Computer Science, Mathematics and Statistics to the Western Colorado Community College. The department no longer controls the hiring or supervision of instructors of these courses.

2006 The Office of Academic Affairs decreed that placement requirements for courses would be advisory rather than mandatory. Prior to this, the standard was that each student had to pass a prerequisite course or to obtain a passing score on a placement test. To bypass this requirement the student had to meet with the course instructor or department chair and obtain a signed waiver of the requirement.

2005-2007 Mesa State College was one of eleven institutions in the country chosen (out of over 80 applicants) to participate in the Mathematical Association of America's College Algebra Renewal Project (funded by NSF) to investigate the impact of a modeling-oriented (application based) college algebra course on student learning and student success. The Project was motivated by low pass rates in college algebra courses across the nation, including at Mesa State College. In 2006, students from twelve sections of college algebra at MSC participated in the study. Six of those sections of college algebra were taught from a modeling perspective and six were traditionally taught. More students successfully completed (C or better) the modeling course (60.9%) than the traditionally taught control sections (46.6%). Students who chose to participate in the study were followed for two semesters in subsequent mathematics courses in order to compare the performance of the students who took a modeling based course to those who took a traditionally taught section of college algebra. A budget request for funds to continue the study was denied

2007 Mathematical Statistics II (STAT 351) was added and was made a required course for the statistics concentration.

2007-2012 The Mesa State, Middle School, Math & Science Partnership (MS)3 was a federally funded (No Child Left Behind) grant through the Colorado Department of Education. The primary goal of the grant was to improve the content knowledge of middle school math and science teachers in five high-need school districts in western Colorado. The director of the program and the math content instructors were faculty in the mathematics program at Mesa State.

2008 The number of credit hours for Introduction to Advanced Mathematics (MATH 240) was increased from 3 to 4 credit hours, in order to enhance student logic and proof-writing skills. This will better prepare students for the rigors of upper-division Mathematics courses.

2009 MATH 236, Differential Equations and Linear Algebra, was added to the curriculum to support the new Mechanical Engineering Program at CMU offered by University of Colorado, Boulder.

2010 A new tenure-track faculty member was hired in mathematics to fill a vacancy caused by retirement.

2010 STAT 215, Statistics for Social and Behavioral Sciences, was added to the curriculum.

2010 MATH 362, Fourier Analysis, was added as an upper division elective. This course introduces mathematics of signal processing including MP3 and JPEG compression as well as other calculus based methods for processing sound waves and digital images.

2011 A new tenure-track faculty member was hired in mathematics to fill a vacancy caused by retirement.

2011 Mesa State College is renamed Colorado Mesa University

2012 MATH 135/136, Engineering Calculus I and II, were created to support the engineering program. These courses cover the same material as Calculus I and II but do it in four credit hours instead of five.

2012 A new tenure-track faculty member was hired in statistics.

2013 MATH 389, Explorations in Mathematics for Elementary Educators, was added as an upper division requirement for Liberal Arts majors concentrating in Elementary Education to replace the M394, Mathematics Colloquium requirement.

2013 MATH 415, Abstract Algebra for Secondary Educators, was added to the curriculum as an alternative to MATH 490, Abstract Algebra I, for students concentrating in secondary education. This course addition addresses a scheduling challenge for students in that concentration.

Appendix C

Faculty Vitae

Name:

Christopher J Aquinto

Start Year: 2012

Program:
Mathematics

Department:
Computer Sciences, Mathematics, and Statistics

COLORADO MESA UNIVERSITY

Full-time Faculty Vita

Faculty Rank

○ Professor ○ Assistant Professor

○ Associate Professor ◉ Instructor

Highest Degree

MS	University of Colorado Denver	Applied Mathematics	2012

Education: (List all degrees beginning with most recent-include post docs and external certificates)

MS, Applied Mathematics, University of Colorado Denver, 2012;

BS, Mathematics, Colorado Mesa University, 2009;

AA, Arapahoe Community College, 2004

Teaching 2003-Present:

Courses Taught

MATH 110, College Mathematics
MATH 113, College Algebra
MATH 119, Precalculus Mathematics
MATH 135, Engineering Calculus 1
MATH 136, Engineering Calculus 2
MATH 146, Calculus for Biological Sciences

Scholarship and Creative Work, 2003-Present:

Service 2003-Present:

Department

Precalculus Book Committee, 2013
Calculus Book Committee, 2014

Advising 2003-Present:

Honors and Awards 2003-Present:

Professional Experience:

Please record the number "items/events" you have listed above in the following categories.
If you specify items/events under "other," please provide an explanation/definition.

Books	**Book Reviews**	**Creative Publications**
Journal Articles	**Performances**	**Patents**
Conference Presentations	**Exhibitions**	**Grants-funded and non-funded**
Sabbaticals	**Fullbright**	**Book Chapter**
Other (related to discipline)		

Nathan M. Atkinson

www.linkedin.com/in/n8atkinson
nathanslemma@gmail.com
Grand Junction, Colorado
970-462-7493

Summary

Preferably looking for a technical career position utilizing my mathematics degree, wide range of talents and experience, and dedication. I have customer service, teaching, industrial, agriculture, laboratory, field, inventory control, cash management, office, and accounting experience, to name a few.

Education

Graduate Student in Applied Mathematics, University of Colorado – Denver, 2010 – 2011
Bachelors of Science in Mathematics, Mesa State College, 1999 – 2005; GPA Concentration 3.32, Cumulative 3.26

Experience

Home Delivery Technician, Select Comfort, Grand Junction, CO, April 2014 to presentation
Delivery and installing of new product into customers homes. Also includes removal of old product, driving a 16' box truck, and shipping and receiving at a local dock.

Center Pivot Sprinkler Technician & Office Technical Support, Quality Irrigation, Yuma, CO, December 2011 – February 2014
Install, repair, and maintain drive train, electrical and structure components on several brands of irrigation sprinklers. Winterization Foreman winter of 2012-2013. Basic AgSense (remote operation) installations. Ability to prepare for working outside in all weather conditions and assess on-site safety. State certified well tester, responsible for certification of client's agriculture wells totalizing-flow-meters, determining power consumption coefficients and state reporting. Duties also included working with 3-phase 480 volt pump and pivot control panels. Operated a 2500 Dodge Ram with trailer for a total weight of 17,000 LBS (in daily 4×4 conditions), a forklift, and a tele-handler. Mapped 4,000 locations on to Google Earth, built a wireless display system for the front office, and provided office technical support.

Adjunct Mathematics Faculty, Morgan Community College, Wray, CO, May 2011 – December 2011
Responsible for preparing, teaching, and assessing remedial college mathematics courses for night working adult programs. This included delivering content via the internet keeping grades online, and personal tutoring. Specialized in hybrid class instruction utilizing Pearson's MyMathLab. Most students were in their first semester of higher education. I assisted them in adapting to their new roles and non-traditional students.

Mathematics Teacher, Otis Jr.-Sr. High School, Otis, CO, August 2011 – October 2011
Plan, prepare, present, asses, etc mathematics instruction and skill retention for the following:
Pre-Algebra (7th Grade), Algebra I (8th grade), Geometry (9th grade), Algebra II (10th grade), Honors College Algebra (11th grade, dual credit), Honors College Calculus (12th grade, dual credit, hybrid with Cengage's WebAssign). Participated in aligning curriculum to state standards. Kept student grades in an on-line computer system.

Accounts Payable Clerk, JBS Five Rivers Cattle Feeding LLC – Yuma Feed Lot, Yuma, CO, January 2009 – October 2010
Responsible for recording and handling of all non-payroll, non-cattle, and non-commodities payable accounts. This also included tracking of all yard fuel use per equipment and stock. Assisted office/accounting manager with monthly accounting reports and numerous other projects as needed. Trained as office floater, which included filing and all scale duties. Additionally responsible for vehicle and equipment inventory. Converted physical fuel inventory reporting from paper to managed spreadsheet program.

Inside Sales, Fastenal, Yuma, CO, December 2008- September 2010
Place orders with walk-in and call-in customers. Inventory control, shipping/receiving, fulfilled orders, filed paperwork. Participated in continuing hardware/product training to better provide solutions to customers.

Plant Operator, Yuma Ethanol LLC, Yuma, CO, July 2007 – November 2008
Employed prior to plant start-up. Trained as a Cook (fermentation, four months) and D&E (distillation and energy, eleven months) and a lead-in-training (six weeks). Accountable for constant team work, communication (in-person and by radio), and process knowledge in monitoring and managing primary and supportive alcohol production processes. Cook and D&E experience included routine laboratory collection and analysis of various samples, final product certifications, water tests, steam turbine and boiler control, and assisting in procedural trouble shooting. New lead responsibilities also included coordinating safety procedures throughout the facility, plant wide communications, meeting production goals, and overseeing product load out. This included lock-out-and-tag out procedures. Ability to read and utilize P&ID (piping and instrument diagrams) documents. Regular use of forklift and company

pickup, occasional use of front-end loader and skid-steer.

Mathematics Teacher, Yuma Middle School, Yuma, CO, August 2006 – May 2007
Responsible for two classes each of 8th Grade Algebra and 7th Grade Pre-Algebra, one class of 8th Grade United States History and a mathematics remediation course. Duties included coordinated implementation of state educational standards in school wide instructional, instruction, assessment, and curriculum integration.

Mesa State College, Grand Junction, CO
SOAR (Student Orientation Advising and Registration) 2003
Math Tutor (groups, open labs, private) 2003 – 2005
Homework grader, College Algebra, One Year
Colorado Space Studies Grant project funded by N.A.S.A. (develop, launch, and recover rover in team environment) 2003
Independent Studies (six local presentations, two regional presentations, one national presentation, two local news channel interviews, and four years use of Maple) 2001 – 2005
Math Club (president, organized regional high school activity and planned two conference trips) 2002 – 2005

Delivery Driver, Junct'n Square Pizza, Grand Junction, CO July 2004 – August 2006
Organize, plan, and deliver food orders; cleaning, customer service, team work, answering phones.
Supervisor: Mike Richardson, 970-254-8844, 119 N. 7th Street, Grand Junction, CO, 81501

Circuit City, Grand Junction, CO September 1998 – December 2002
Customer service, warehouse stocking/receiving/shipping/delivery, operations, cash office, security, sales, returns, phone system, customer repairs, and cleaning.

Camp Staff, Boy Scouts of America, Grand Junction, CO, June 1991 – August 1994
Summer camp staff at O.A. Greagor wilderness camp (1991, 1992, 1994). First year in the food commissary. Last two years as trading post director. Also as a merit badge counselor.

Bus Boy/Dish Washer, Sizzler USA, Grand Junction, CO, August 1992 – June 1994

Volunteer Work
ESL Conversation Support, BYU-Idaho, October 2013 – December 2013
Helped international college students direct structured conversations in English via Skype.

G.E.D. Tutor, Yuma County, CO, Social Services/Employment First, January 2011 – August 2011
Tutored mathematics one-on-one and in small groups to individuals working to earn their G.E.D.

South Africa, August 1996 – September 1998
Community service, including four months of office work for the support of two hundred volunteers situated in four countries.

Miscellaneous Community Service, Colorado, 1985 – Present
Many and various faith and secular based community service projects.

Honors, Activities, Associations
Eagle Scout, Boy Scouts of America 1995
Employee of the Month (Circuit City) July 1999
Saccomanno, M.C.T.F.C.U, Goodhart, and CO Space Grant Scholarships while at Mesa State College
Mathematical Association of America
Society for Industrial and Applied Mathematics
Association of Computing Machinery
College Reading and Learning Association (nationally certified tutor) 2003 – 2005
Outstanding Tutor (Mesa State College) Fall 2004
Certificate of Appreciation (Mesa State College Math Dept.) 2005
Mesa State College Math Exit Exam (highest score in two years) 2005
Awarded Graduate Teaching Assistantships at U. of Wyoming., Rochester Institute of Technology, Arizona State University, University of Denver 2005, 2006
Mesa State College Concert Choir (Performed Brahms's Requiem, Honegger's King David, Bernstein's Chichester Psalms)
University of Wyoming/Rocky Mountain Mathematics Consortium/ IMA conference (Stochastic Partial Differential Equations & Environmental and Geophysical Modeling) June 2005

Transcripts and References available upon request

Name:

Cathy Barkley

Start Year: 1985

Program:
Mathematics

Department:
Computer Sciences, Mathematics, and Statistics

COLORADO MESA UNIVERSITY

Lecturer Vita

Highest Degree

PhD	Institution University of Denver	Discipline Curr & Instruction: Mathematics Educ.	1995

Education: (List all degrees beginning with most recent-include post docs and external certificates)

M.A. in Mathematics Education from Purdue University

B.A. in Mathematics from

Teaching 2003-Present:

Courses Taught

MATH 340 Ethnomathematics

MATH 496 Ethnomathematics Masters

Prior Professional Experience Relevant to Current Position: (Include year(s) of employment, employer, position title and responsibilities)

Year(s) of Employment	Employer	Position Title	Position Responsibilities

Please record the number "items/events" you have listed above in the following categories.
If you specify items/events under "other," please provide an explanation/definition.

Books	**Book Reviews**	**Creative Publications**
Journal Articles	**Performances**	**Patents**
Conference Presentations	**Exhibitions**	**Grants-funded and non-funded**
Sabbaticals	**Fulbrights**	**Book Chapters**
Other (related to discipline)		

Name:

Andrea E Barnard

Start Year: 2012

Program:
Mathematics

Department:
Computer Sciences, Mathematics, and Statistics

COLORADO MESA UNIVERSITY

Full-time Faculty Vita

Faculty Rank

○ Professor ○ Assistant Professor

○ Associate Professor ◉ Instructor

Highest Degree

MEd	University of Texas at Arlington	Curriculum and Instruction with an emphasis in Mathe	2011

Education: (List all degrees beginning with most recent-include post docs and external certificates)

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

MATH 110, College Math

MATH 113, College Algebra

MATH 301, Mathematics for Elementary Teachers

Evidence of Continuous Improvement

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 Wednesday, 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," Poster

Presentation at the Department of Energy Intern Poster Seminar, Idaho National Lab, Idaho Falls, ID (2009).

Other:

Unpublished research

"The Effects of Participating in Integrated Mathematics Curricula on Students' Mathematics and Reading Abilities," Unpublished Capstone 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:

Department

2014

- Participated in the department's ACCUPLACER Diagnostic Pre-Test to collect data on student placement
- Served on the Math 110 Book Selection Committee
- Served on the Math 113 Book Selection Committee

Advising 2003-Present:

University level

2014

New Student Orientation Programs: 1

Mesa Experience Sessions: 1

Honors and Awards 2003-Present:

National

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

Local

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:

Please record the number "items/events" you have listed above in the following categories.
If you specify items/events under "other," please provide an explanation/definition.

	Books	**Book Reviews**	**Creative Publications**
	Journal Articles	**Performances**	**Patents**
1	**Conference Presentations**	**Exhibitions**	**Grants-funded and non-funded**
	Sabbaticals	**Fullbright**	**Book Chapter**
2	**Other (related to discipline)**	Two unpublished research projects/papers.	

Name:

Robert B Beeken

Start Year: 2011

Program:
Mathematics

Department:
Computer Sciences, Mathematics, and Statistics

COLORADO MESA UNIVERSITY

Lecturer Vita

Highest Degree

PhD	The University of Iowa	Physics	1977

Education: (List all degrees beginning with most recent-include post docs and external certificates)
PhD in Physics, The University of Iowa, 1977

MS in Physics, Ohio University, 1974

BA in Physics, Mathematics, and Chemistry, Western State College of Colorado, 1972

Teaching 2003-Present:
Courses Taught
MATH 113, College Algebra

Evidence of Continuous Improvement

Innovative Materials/Activities

Prior Professional Experience Relevant to Current Position: (Include year(s) of employment, employer, position title and responsibilities)

Year(s) of Employment: 1980 - 2010
Employer: University of Wisconsin-Stevens Point
Position Title: Assistant Professor, Associate Professor, Professor and Chair, Associate Vice Chancellor
Position Responsibilities: Teaching, Scholarship, Service, and Administration

Please record the number "items/events" you have listed above in the following categories.
If you specify items/events under "other," please provide an explanation/definition.

	Books	**Book Reviews**		**Creative Publications**
29	**Journal Articles**	**Performances**		**Patents**
10	**Conference Presentations**	**Exhibitions**	12	**Grants-funded and non-funded**
1	**Sabbaticals**	**Fulbrights**	1	**Book Chapters**
2	**Other (related to discipline)**	Semester Abroad Faculty Leader - Britain (2005) and Poland (2010)		

Name:

Jesse M Bollinger

Start Year: 2010

Program:
Mathematics

Department:
Computer Sciences, Mathematics, and Statistics

COLORADO MESA UNIVERSITY

Full-time Faculty Vita

Faculty Rank

○ Professor ○ Assistant Professor

○ Associate Professor ◉ Instructor

Highest Degree

MS	Stanford University	Management Science and Engineering	2004

Education: (List all degrees beginning with most recent-include post docs and external certificates)

MS, Management Science and Engineering, Stanford University, 2004

BS, Mathematical and Computational Sciences, Stanford University, 2003

Teaching 2003-Present:
Courses Taught
Math 110, College Mathematics
Math 113, College Algebra
Stat 200, Probability and Statistics
Stat 311, Statistical Methods
Stat 313, Sampling Methods

Scholarship and Creative Work, 2003-Present:

Service 2003-Present:
College Algebra textbook committee, 2011

Advising 2003-Present:

Honors and Awards 2003-Present:

Professional Experience:

Please record the number "items/events" you have listed above in the following categories.
If you specify items/events under "other," please provide an explanation/definition.

Books	**Book Reviews**	**Creative Publications**
Journal Articles	**Performances**	**Patents**
Conference Presentations	**Exhibitions**	**Grants-funded and non-funded**
Sabbaticals	**Fullbright**	**Book Chapter**
Other (related to discipline)		

Name:

Catherine M Bonan-Hamada

Start Year: 1996

Program:
Mathematics

Department:
Computer Sciences, Mathematics, and Statistics

COLORADO MESA UNIVERSITY

Full-time Faculty Vita

Faculty Rank

(•) Professor ( ) Assistant Professor

( ) Associate Professor ( ) Instructor

Highest Degree

PhD	University of Colorado--Boulder	Mathematics	1994

Education: (List all degrees beginning with most recent-include post docs and external certificates)

Ph.D., Mathematics, University of Colorado Boulder, 1994

M.S., Mathematics, Colorado State University, 1988

B.S., Applied Mathematics, Colorado State University, 1986

Teaching 2003-Present:

Courses Taught

MATH 110, College Mathematics
MATH 113, College Algebra
MATH 119, Precalculus Mathematics
MATH 130, Trigonometry
MATH 149, Honors Mathematics
MATH 151, Calculus I
MATH 152, Calculus II
MATH 240, Introduction to Advanced Mathematics
MATH 325, Linear Algebra I
MATH 352, Advanced Calculus
MATH 394, Mathematics Colloquium
MATH 450, Complex Variables
MATH 460, Linear Algebra II
MATH 484, Senior Seminar I
MATH 490, Abstract Algebra I
MATH 491, Abstract Algebra II
MATH 494, Senior Seminar II
EDUC 596, Topics: Algebra and Number Sense

Evidence of Continuous Improvement

Workshop on The Degree Qualifications Profile by Dr. Paul Gaston, CMU, Jan. 5-6, 2012

Learning and Study Strategies Inventory (LASSI) Implementation by Sonia Brandon, CMU, Oct. 18, 2011

Teaching Calculus with Interactive Figures, Webinar by Dr. Lyle Cochran, Feb. 17, 2011

Campus Professional Development and Safety Training, MSC Feb. 3, 2011

Web-page Training by Dr. Ann Spalding, MSC, Jan. 24, 2011

Workshop on Restoring the Joy in Teaching by Dr. Sally Phelps, MSC, Jan. 15, 2010

Workshop on Universal Design of Course Materials by Nancy Conklin and Javier Leung-Long, MSC, Oct. 22, 2010

Delta Kappa Gamma Society International 2007 Omega State Southwest Convention, June 28, 2007

Workshop on The 10 Best and 10 Worst Teaching Practices and Fast and Fair Grading by Dr. Linda Nilson, MSC, May, 2007

2007 Spring Meeting of Rocky Mountain Section of the Mathematical Assoc. of America, CSU-Pueblo, April 13-14, 2007

Advisor training for CAPP (Curriculum Advising and Program Planning) reports Oct. 9, 2009 and February 17, 2007

2006 Spring Meeting of Rocky Mountain Section of the Mathematical Assoc. of America, MSC, April 7-8, 2006

CRAFTY Workshop: Redesigned College Algebra, Mathematical Association of America, UNM, August 1-3, 2005

2004 Spring Meeting of Rocky Mountain Section of the Mathematical Assoc. of America, CC, April 16-17, 2004

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

Continued Fraction Handbook Workshop IV, Norwegian Univ. of Science and Technology, Norway, August 7-11, 2003,

2003 Spring Meeting of the Rocky Mountain Section of the Mathematics Assoc. of America, USAFA, April 25-26, 2003

Java Workshop, USAFA, April 25, 2003

Continued Fraction Handbook Workshop II, Norwegian Univ. of Science and Technology, Norway, Jan. 27-31, 2003

Innovative Materials/Activities

College Algebra from a Modeling Perspective: From 2005-2007 I participated in the Mathematical Association of America's College Algebra Renewal Project (funded by NSF) to investigate the impact of a modeling oriented (application based) college algebra course on student learning and student success.

Content instructor for the Mesa State, Middle School, Math and Science Partnership, a federally funded (No Child Left Behind) grant through the Colorado Department of Education.

Supervision of Student Research/Project(s)

2011-2012, Course instructor for M484-494 Senior Seminar I (14 students) and II (11 students). This course sequence acts as the capstone experience for math majors. It is an introduction to conducting mathematical research. Each student completes an in-depth research project under the supervision of the course instructor and a faculty mentor.

2010-2011, Course instructor for M484-494 Senior Seminar I (3 students) and II (3 students). This course sequence acts as the capstone experience for math majors. It is an introduction to conducting mathematical research. Each student completes an in-depth research project under the supervision of the course instructor and a faculty mentor.

2009-2010, Course instructor for M484-494 Senior Seminar I (7 students) and II (7 students). This course sequence acts as the capstone experience for math majors. It is an introduction to conducting mathematical research. Each student completes an in-depth research project under the supervision of the course instructor and a faculty mentor.

2007-2008, I mentored a project (M484-M494 Senior Seminar I and II) for a student who studied the numerical computation of the Schwarz-Christoffel transformation.

2006-2007, I mentored a project (M484-M494 Senior Seminar I and II) for a student who studied some of the classic convergence theorems in the analytic theory of continued fractions.

2005-2006, I mentored a project (M484-M494 Senior Seminar I and II) for a student who studied applications of complex analysis to fluid flow

Scholarship and Creative Work, 2003-Present:
Scholarship Related to Discipline

Book Chapters

"Moment Theory and Orthogonal Functions," in *Handbook of Continued Fractions for Special Functions*, Springer, 2008.

Journal Articles

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.

Stieltjes Continued Fractions for Polygamma Functions; Speed of Convergence (with W.B.Jones), Journal of Computational and Applied Mathematics, 179, (2005), 47-55.

Stieltjes 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, Summer 2004, 5-68.

Conference Presentation

Stieltjes Continued Fractions and Special Functions, August 12, 2003, Conference on Orthogonal Functions and Related Topics, Roros, Norway

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

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

Book reviews

Reviewer/class tester for *Calculus: Early Transcendentals* by Briggs and Cochran, 2010, published by Addison Wesley.

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

Other
Co-Editor/Reviewer of the mathematics journal *Communications in the Analytic Theory of Continued Fractions, 1998-present*

Referee for *Computing Orthogonal Rational Functions with Poles Near the Boundary* by J. van Deun, A. Bultheel and Pablo Gonzalez-Vera for Journal of Computers and Mathematics with Applications, 2006.

Referee for *A Christoffel-Darboux formula and a Favard's Theorem for Orthogonal Laurent Polynomials on the Unit Circle* by Ruyman Cruz-Barroso and Pablo Gonzalex-Vera for Journal of Computational and Applied Mathematics, 2004.

Co-Editor of Proceedings of the conference 2001 Mathematics Odyssey, Rocky Mountain Journal of Mathematics, Summer 2003.

Scholarship Related to Pedagogy in Discipline

Book Chapter

"Modeling-Oriented College Algebra at Mesa State College" in *Partner Discipline Recommendations for Introductory*

College Mathematics and the Implications for College Algebra , Mathematical Association of America, 2011

Conference Presentations

Some Geometric Proofs of the Pythagorean Theorem, January 30, 2009, Mathematics Colloquium, Department of Computer Science, Mathematics and Statistics, Mesa State College.

Some Geometric Proofs of the Pythagorean Theorem, November 7, 2008, The Mesa State, Middle School, Math and Science Partnership Professional Development Workshop, John McConnell Math and Science Center, Grand Junction, Colorado.

Modeling Oriented College Algebra (with Dr. Tracii Friedman), April 4, 2007, Mesa State College Faculty Colloquium.

Teaching College Algebra from a Modeling Perspective (with Dr. Tracii Friedman), April 13, 2007, 2007 Spring Meeting of the Rocky Mountain Section of the Mathematical Association of America, Colorado State University at Pueblo.

To be Continued...Fractions, October 20, 2006, Mathematics Colloquium, Department of Computer Science, Mathematics and Statistics, Mesa State College.

Other:
Grants

Grant recipient ($5000) as part of the Mathematical Association of America's College Algebra Renewal Project, a study funded by the National Science Foundation, to investigate the impact of a modeling oriented (application based) college algebra course on student learning and student success, 2005-2007

Sabbaticals

Fall 2003--The Continued Fraction Handbook Project

Professional Memberships

Mathematical Association of America--1992-present

Service 2003-Present:

University

HLC Committee, Criteria 4, 2011-present

Student Academic Success Working Group, 2010-2011

Tenure and Promotion Committee, 2009-present

Student Showcase moderator, 2011

Faculty Senate Round Table, Sept. 9, 2010

Panel on Teaching Effectiveness, New to Mesa State Orientation program, August 13, 2007

Calendar Committee, Mesa State College, 2005

Commission on Governance, an advisory committee to the Board of Trustees of the State Colleges in Colorado, 2001-2003

Academic Master Plan Oversight Committee, Mesa State College, 2001-2004

NCA Self-Study Committee on Criterion V: Integrity, Mesa State College, 2002-2003

Handbook Committee, committee to merge OSC, MSC and UTEC Handbooks, 2004

Tenure Committee, School of Natural Sciences and Mathematics, 2001-2004

Library Mission Statement Committee, Mesa State College, 2003-2004

Club Co-advisor for Ho'o'lokahi, the MSC Polynesian Club, 1997-2010

Department

Math Placement Committee, 2011-present

CSMS Pre-tenure Committee, 2009-present

Mathematics Program Review, Chair , 2008

Math Minor Revision Committee, 2007-2010

Math Search Committees, 2009-2010 and 2010-2011

Coordinator for receptions for mathematics graduates that are held each May, 2002-present

Outstanding Mathematics Graduate Selection Committee, 2006-present

Assistant advisor for Math Club, 2008-2010

KME faculty, 1994-present

Mathematics Education Search Committee Chair, 2004-2005

Advisory Committee, CSEMS scholarship program, School of Natural Sciences and Mathematics, 2001-2003

Mentor for several students who are recipients of the CSEMS Scholarship, 2000-2003

Community

Volunteer, Wingate Elementary, 2009-present

PTA, Wingate Elementary, 2009-present

Scholarship selection committee for Western Rockies Federal Credit Union, May 17, 2010

Parent volunteer at Wingate Elementary School, 2009-present

Member of Board of Directors for Little Mavericks Learning Center, 2008-2009

Member Advisory Committee, Western Rockies Federal Credit Union, 2002-2008

Delta Kappa Gamma Society International (honor society for teachers), participate in fund raising activities for scholarship awarded annually to woman seeking degree in education at Mesa State College, 1999-present

Judge, Senior Finals, Mesa State College Science Fair, March 2005

Judge, Junior Finals, Mesa State College Science Fair, March 2001, March 2003

Regional

Rocky Mountain Section of the Mathematical Association of America, Nominating Committee, 2010-present

MAA Program Committee Chair, 2006 Spring Meeting of the Rocky Mountain and Intermountain Sections of the Mathematics Association of America, hosted by Mesa State College, April 7-8, 2006

Advising 2003-Present:

University level

2011
Mesa Experience, April 16, 2011
SOAR, June 10, 2011
Major Fair, Oct. 11, 2011

2010
Mesa Experience, Feb. 27, 2010
Mav Scholar, Sept, 24, 2010

2009
Early Scholars, April 24, 2009

2008
Mesa Madness, Feb. 2, 2008
Mesa Madness, Feb. 29, 2008
Mav Scholars, April 1, 2008
Mesa Experience, October 4, 2008

Department level

Advisor for between 4 and 10 mathematics majors per year

Honors and Awards 2003-Present:

Outstanding Educator Award, Grand Junction Chamber of Commerce, 2005

Certificate of Excellence in Education, Associated Student Government, Mesa State College 2004.

Professional Experience:

Please record the number "items/events" you have listed above in the following categories.
If you specify items/events under "other," please provide an explanation/definition.

	Books	**Book Reviews**		**Creative Publications**
3	**Journal Articles**	**Performances**		**Patents**
8	**Conference Presentations**	**Exhibitions**	1	**Grants-funded and non-funded**
1	**Sabbaticals**	**Fullbright**	2	**Book Chapter**
4	**Other (related to discipline)**			

Name:

Edward Bonan-Hamada

Start Year: 1996

Program:
Mathematics

Department:
Computer Sciences, Mathematics, and Statistics

COLORADO MESA UNIVERSITY

Full-time Faculty Vita

Faculty Rank

○ Professor ○ Assistant Professor

◉ Associate Professor ○ Instructor

Highest Degree

PhD	University of Colorado, Boulder	Mathematics	1996

Education: (List all degrees beginning with most recent-include post docs and external certificates)

PhD Mathematics

MA Mathematics, University of Hawai'i, Manoa

BA Biology, University of Rochester

Teaching 2003-Present:
Courses Taught
Intermediate Algebra (MATH 091)
College Mathematics (MATH 110)
College Algebra (MATH 113)
Trigonometry (MATH 130)
Precalculus (MATH 119)
Calculus for the Biological Sciences (MATH 146)
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)
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

Evidence of Continuous Improvement:

• **2008-current Research into the substructural logics of everyday mathematics**. This research is interested in explicating the semantics and resulting logical infrastructure that generates the algorithms utilized to do mathematics without full Zermelo-Frankel-Axiom of Choice set theory. Current student projects falling under this use fragments of admissible set theory and closed-world reasoning.

• **Fall 2008 Applied for Fulbright Grant** to work with Dr. Keith Stenning, Professor Emeritus of Cognitive Science,

University of Edinburgh and Dr. Wilfrid Hodges, retired Professor of Mathematics, Queen Mary College on the reasoning systems humans use to learn mathematics.

• **2008 Attendee Workshop on Logic, Language, Information and Computation,** Heriot-Watt University, Edinburgh, Scotland, UK

• **2007 Presenter Spring Meeting of the Rocky Mountain Section of the MAA,** CSU-Pueblo, Pueblo, Colorado

• **2006 Assistant to Organizer Spring Joint Meeting of the Rocky Mountain and Intermountain Sections of the Mathematical Association of America,** Mesa State College, Grand Junction, Colorado

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

2003 Attendee 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

Supervision of Student Research/Project(s): I have directed Senior Research Projects for seven mathematics majors and currently directing two projects that are an outgrowth of my research interests which are at the border between mathematical logic and cognitive science.

• **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.

Scholarship and Creative Work, 2003-Present:

See **2008-current Research into the substructural logics of everyday mathematics** above. It should be noted that this research is, to my knowledge, new and not in the literature and is significantly different from my dissertation.

Professional Memberships :

Association for Symbolic Logic

Service 2003-Present:

University

• **Member of the Wellness Committee (2010-present):** The Wellness Committee is charged with promoting wellness, widely construed, in the CMU community.

• **Tai Chi Class (2004):** Recognizing the health benefits of Tai Chi Chuan, a Chinese internal martial art, I arranged to have a faculty/staff tai chi class taught on campus.

• **Mathematics Projects Lab (MPL)(2004-present):** Assisted with the development of the MPL by submitting to the VPAA a "white paper" justifying and detailing the need for the MPL and the resources that would be needed for its projected use. I was also responsible for determining the software needs of the mathematics program as it pertained to the MPL and arranged its purchase.

• **Tai Chi Instruction (2005):** I taught a Tai chi class for the Intramural Program at the Student Recreation Center every Friday in the Fall Semester and every Wednesday in the Spring Semester. This semester, classes are held every Wednesday 5:30-6:30pm.

• **Dependent's Benefits Committee:** This committee was charged with trying to define tuition benefits for dependents

• **NSF Interdisciplinary Grant in Mathematical Sciences Submission:** A grant that would have funded opportunities for interdisciplinary student research and curriculum development for mathematical biology and computational mathematical biology courses.

NSF Interdisciplinary Grants for Undergraduates in Biology and Mathematics Submission: Another grant that would have funded interdisciplinary activities with a mathematics foundation.

• **NSF RUI Grant Submission:** A Research at Undergraduate Institutions proposal was submitted to the Behavioral and Cognitive Sciences division to study embodied mathematics and its transition to advanced mathematical thinking.
• **Initial Contact for Computer Science Internships:** I was the initial contact for three internships with Efficient Workflow Solutions. My contact, Alan Lamar, helped provide a really great opportunity for three of our CS students. The company has hired one of those interns.
• **Member of the Wellness Committee (2010-present):** The Wellness Committee is charged with promoting wellness, widely construed, in the CMU community.
• **Member of the Campus Safety Committee (2009-present):** Initially appointed as the Faculty Senate representative to this committee that is charged with improving the safety of the campus and is particularly interested in preventing and preparing for "shooter" incidents. In addition, I have assisted Dr. Tim Pinnow with a self-defense workshops sponsored by the committee.
• **Member of the Suicide Prevention Coalition (2009-present):** This committee is charged with suicide intervention for the CMU community and is part of the triangle of interrelated committees along with Wellness and Safety. As part of this committee I participated in Applied Suicide Intervention Skills Training (ASIST) training and am now certified in ASIST. Over the last eight years there have been three completed staff suicides and at least four completed student suicides. It should be noted that in both the Columbine and Virginia Tech shootings the protagonists were suicidal.
• **Chair of the 2010-2011 CSMS Mathematics Tenure Track position search:** This search resulted in the hiring of Dr. Sean Robinson for a tenure track position in mathematics. The applicant pool consisted of seventy-four applicants.

Advising 2003-Present:

I have been the advisor to four mathematics majors since 2003

Honors and Awards 2003-Present:

Professional Experience:

Please record the number "items/events" you have listed above in the following categories.
If you specify items/events under "other," please provide an explanation/definition.

0	**Books**	0	**Book Reviews**	0	**Creative Publications**
0	**Journal Articles**	0	**Performances**	0	**Patents**
1	**Conference Presentations**	0	**Exhibitions**	3	**Grants-funded and non-funded**
0	**Sabbaticals**	0	**Fullbright**	0	**Book Chapter**
0	**Other (related to discipline)**				

Dr. Gary W. De Young

872 Summer Bend Ct
Grand Junction, CO 81506

Phone: 970-314-2310
Email:tekel.enterprises@gmail.com

EDUCATION:

- 1990 Doctor of Philosophy in Mathematics, University of Utah; Salt Lake City, Utah

  Dissertation: A Mathematical Basis for Phase Response Curves and Their Application to Coupled Oscillators. Adviser: Professor Hans G. Othmer

  Phase response curves are tools that are used by biologists to measure the effects of stimuli on a normally rhythmic biological events. The response, measured as a phase shift in the biological system, is dependent on when the stimulus is given. In my dissertation, I showed how phase response curves from biological systems were related to phase locking of a general system of differential equations that has an oscillatory solution. This essentially connected a dynamical systems use of phase response curves to phase locking. Thus, giving phase response curves a firm basis for biological purposes. I also showed how they might be defined and applied to systems of coupled oscillators.

- 1988 Masters of Science in Mathematics, University of Utah; Salt Lake City, Utah
- 1984 Bachelors of Science with Honors: Math Major, Computer Science Minor. Calvin College; Grand Rapids, Michigan

PROFESSIONAL EXPERIENCE:

- 2006–2014 Prof. Mathematics, Dordt College, Sioux Center, IA
- 2000–2006 Asso. Prof. Mathematics, The King's University College, Edmonton AB (Tenured 2005)
- 1995–2000 Asst. Prof. Mathematics, Mesa State College of Colorado, Grand Junction, CO. (Tenure Track, awarded tenure and received promotion to Associate Professor in the spring of 2000)
- 1994–1995 Asst. Prof. Mathematics, Calvin College, Grand Rapids, MI. (Sabbatical replacement)
- 1992–1994 Asst. Prof. Mathematics, Western State College of Colorado, Gunnison, CO. (Sabbatical replacement)
- 1990–1992 Post Doctoral Fellowship, Institute of Theoretical Dynamics, University of California, Davis, CA.
- 1986–1990 Teaching Fellow, University of Utah, Salt Lake City, UT.
- 1989 Research adviser for undergraduate participants in an NSF funded Research Experience for Undergraduates, University of Utah, Salt Lake City, UT.
- 1984–1986 Teaching Assistantship, University of Utah, Salt Lake City, UT.

TEACHING EXPERIENCE, ETC. I have 22 years of college level teaching experience at all levels of instruction in both private and public institutions.

- Courses Taught at Dordt College include Elementary Statistics, Calculus I, Calculus II, MultiVariable Calculus, Linear Algebra, Differential Equations, Probability and Statistics, Numerical Analysis, 293 Problem Solving Seminar, Real Analysis, Complex Analysis, Topics: Mathematical Modeling, and Database System Design
- I have taught a wide range of courses at the undergraduate level since 1992 before Dordt College. The courses include: Intermediate Algebra, College Algebra, Liberal Arts Mathematics, Survey of Mathematics, Trigonometry, Calculus I, II, III and IV, Calculus for Biological Sciences, Discrete Mathematics, Differential Equations, Introductory Linear Algebra, Advanced Linear Algebra, Abstract Algebra, Mathematical Modeling, Intro to Statistics (not my favorite), Euclidean Geometry, and Database Management Systems (Computing Science).
- I have developed a calculus lab manual which introduces first year calculus students to nonlinear differential equations and modeling in the context of first semester calculus using spreadsheets.
- I have developed a database lab manual that focuses relational databases and web applications using PHP.

CAMPUS AND PROFESSIONAL COMMITTEES:

- Division Leader Mathematics & Computer Science, Dordt College 2011–2014
- Mathematics & Computer Science Dept Chair, Dordt College 2010–2014
- Compensation Advisory Committee, Dordt College 2009–2014
- Student Learning Assessment Committee, Dordt College 2008–2010
- Alberta Committee on Undergraduate Programs in Mathematical Sciences, Committee for first and second year analysis Curriculum (Webmaster) 2005–2006
- Chair of the Information Technology Policy Committee, The King's University College. 2004–2006
- Budget Review Committee, The King's University College. 2005–2006
- Faculty Representative to the Board, The King's University College. 2003–2004
- Chair of Faculty Council, The King's University College. 2003–2004
- Academic Affairs Committee, The King's University College. 2002–2004
- Faculty Representative to the Senate, The King's University College. 2002–2004
- Vice Chair of Faculty Council, The King's University College. 2002–2003
- Budget Review Committee, The King's University College. 2001–2004
- Secretary of Faculty Council, The King's University College. 2001–2002
- Professional Handbook Revision Committee, Mesa State College 1997–1998
- Mathematics 5 Year Program Review Committee, Mesa State College 1997–1998
- Mathematics Search Committee, Mesa State College 1996–1998

- Rocky Mountain Section MAA Nomination Committee (Chair of Committee during 1997–1998) 1995–1998
- General Education Committee, Western State College 1993–1994

PRESENTATIONS:

- Dordt College Summer Seminar Series: "Success in First Year College Mathematics: What Math ACT Scores and HS GPA can tells us about Calculus students." Aug 2011
- Dordt College Summer Seminar Series: "Ideas for Introducing Computational Modeling" June 2009
- Calvin College Mathematics Colloquium: "Exploring Reflection: Designing a reflector" June 2009
- Mathematical Association of America Math Fest: "Introducing modeling through Calculus labs." Aug 2007
- Dordt College Math Club Presentation: "Receptor Dynamics and Calcium Oscillations." Feb 2007
- The King's University College Colloquium: "Can you trust Mathematics?" 2005
- Mathematical Biology Seminar, University of Alberta: The Story Behind the De Young-Kiezer Calcium Oscillation Model. 2004
- PIMS Calculus Curriculum Conference: Calculus at The King's University College, A unique approach to calculus labs. 2004
- Mathfest 2003: Constrained Optimization with Implicit Differentiation. 2003
- Rocky Mountain Region MAA Conference: Uniform illumination using spectral reflectors and compact tubular light sources: An application of differential equations. 1996
- UC Berkeley Invited Speaker at The Mathematical Science Research Institute Mathematical Modeling Seminar: A receptor based model for cellular calcium oscillations. 1992

PUBLICATIONS:

1. Gary W. De Young, *Perspective on Mathematical Modeling*, Pro Rege **38(4)**:1-10 (June 2010) 2010
2. Gary W. De Young, *Mathematics, Where does It Fit?* http://www.lastseminary.com/mathematics-christianity/ (also at http://courses.gdeyoung.com/pages.php?cdx=278) 2005
3. Gary W. De Young, *Constrained Optimization with Implicit Differentiation*, The College Mathematics Journal, **34(2)**:148-152 (March 2003) 2003
4. Gary W. De Young, *Exploring Reflections: Designing Light Reflectors for Uniform Illumination.* SIAM Review, **42(4)**:727-735 (Dec 2000) 2000
5. Joel Keizer and Gary W. De Young, *Simplification of a realistic model of IP_3-induced Ca^{2+} oscillations.* (1994) Journal of Theoretical Biology **166**:431–442 1994

6. Joel Keizer and Gary W. De Young, *Effect of voltage-gated plasma membrane Ca^{2+} fluxes on IP_3-linked Ca^{2+} oscillations.* (1993) Cell Calcium **14**:397–410. 1993

7. Gary W. De Young and Joel Keizer, *A Single-pool inositol 1,4,5-trisphosphate-receptor-based model for agonist-stimulated oscillation in Ca^{2+} concentration.* Proc. Natl. Acad. Sci. USA (1992), **89**: 9895–9899 1992

8. Joel Keizer and Gary W. De Young, *Two Roles for Ca^{2+} in Agonist Stimulated Ca^{2+} oscillations.* The Biophysical Journal (1991), **61**:649–660 1991

9. Gary W. De Young, Philip Maini, and Michael Nakamaye, *Analysis of a Risk-based Model for the Growth of Aids Infection.* Mathematical Biosciences (1991) **106**:129–150 1991

10. Gary W. De Young and Hans G. Othmer, *Resonance in Oscillatory and Excitable Systems*, In: Mathematical Approaches to Cardiac Arrhythmias, **591**, Annals of the New York Academy of Sciences. 1989

11. Gary W. De Young, P. B. Monk and H. G. Othmer, *Pacemakers in aggregation fields of Dictyostelium discoideum: Does a single cell suffice?*, J. Math. Biol. (1988) **26**:487–517 1988

12. Gary W. De Young, *Development of the Fundamental Group and the Seifert–Van Kampen Theorem with Application of the Seifert–Van Kampen Theorem*, Senior Thesis, Calvin College, 1984 1984

UNPUBLISHED MANUSCRIPTS:

- Gary W. De Young, *Development of the Fundamental Group and the Seifert–Van Kampen Theorem with Application of the Seifert–Van Kampen Theorem*, Senior Thesis, Calvin College, 1984 1984

OTHER PROFESSIONAL ACTIVITY:

- South Dakota Amateur Hockey Association: Treasurer and Scheduling Consultant. Scheduling Consultant involves ongoing development of tools for collection of information relating necessary for league scheduling and the developing and application of algorithms to create a preliminary league schedule. Also I develop initial schedule for the league scheduler. June 2009 Continuing
- Mathematical Modeling Project on Johnes disease–Work with John Olthoff in the Argiculture Department. 2011–2013
- Service project for Tornadoes Hockey, Sioux Center Iowa. This project involved development of a Content Management System (an interactive database powered information system) for dissemination of the schedules and information concerning Tornadoes Hockey (tornadoeshockey.com). This project involves database modeling and programing and is an example of possible computer science service projects. 2007–2014
- Scheduling Consultant for Edmonton Little League Baseball. This involves constraint based optimization heuristics to find viable balanced playing schedules. This also involves development, maintenance and hosting of an information system for creation and dissemination of the schedules (baseball.tekelenterprises.com). 2005–2013
- Instructor at the 3rd Annual PIMS-MITACS Mathematical Biology Summer Workshop, sponsored by the Center of Mathematical Biology and The Department of Mathematical and Statistical Sciences at the University of Alberta. May 2004

MAJOR COMMUNITY INVOLVEMENT:

- Webmaster Sioux Center Hockey Association.
- Scheduler, league affiliate and president of Sioux Center Hockey Association.

Name:

Lisa D Driskell

Start Year: 2010

Program:
Mathematics

Department:
Computer Sciences, Mathematics, and Statistics

COLORADO MESA UNIVERSITY

Full-time Faculty Vita

Faculty Rank

○ Professor ◉ Assistant Professor

○ Associate Professor ○ Instructor

Highest Degree

PhD	Purdue University	Mathematics	2010

Education: (List all degrees beginning with most recent-include post docs and external certificates)

Ph.D., Mathematics, Purdue University, West Lafayette, IN, 2010

B.S., Mathematics, Central Michigan University, Mount Pleasant, MI, 2003

Teaching 2003-Present:
Courses Taught at Colorado Mesa University
MATH 110, College Math
MATH 113, College Algebra
MATH 119, Precalculus Mathematics
MATH 151, Calculus I
MATH 152, Calculus II
MATH 236, Differential Equations and Linear Algebra
MATH 240, Introduction to Advanced Mathematics
MATH 260, Differential Equations
MATH 325, Linear Algebra
MATH 352, Advanced Calculus
MATH 394, Mathematics Colloquium
MATH 452, Introduction to Real Analysis

Evidence of Continuous Improvement
CMU Faculty Professional Development Workshop, Leslie Meyers; August 2014
Joint Mathematics Meetings, Baltimore, MD; January 2014
Multiple Professional Development Sessions and Panel Discussions Attended.
CMU Teacher 2 Teacher Workshop; November 2013
Self-paced MATLAB software training; June 2013
CMU Teacher 2 Teacher Workshop; April 2013
Joint Mathematics Meetings, San Diego, CA; January 2013
Mini Course Attended: *Teaching Differential Equations with Modeling*
Short Course Attended: *Conceptual Climate Models*;
CMU Teacher 2 Teacher Workshop; December 2012
Campus of Difference Training, Grand Junction, CO; November 2012
CMU Faculty Professional Development Workshop, Ken Bain; August 2012
Mathematical Association of America MathFest 2012, Madison, WI; August 2012
Multiple Professional Development Sessions and Panel Discussions Attended.
Project NExT (New Experiences in Teaching) Workshop, Madison, WI; August 2012
Multiple Professional Development Sessions and Panel Discussions Attended.
Joint Mathematics Meetings, Boston, MA; January 2012
Multiple Professional Development Sessions and Panel Discussions Attended.

Project NExT (New Experiences in Teaching) Workshop, Boston, MA; January 2012
Multiple Professional Development Sessions and Panel Discussions Attended.
Mathematical Association of America MathFest 2011, Lexington, KY; August 2011
Mini Course Attended:*Undergraduate Research --How to Make It Work*; 8/4-8/5/2011
Project NExT (New Experiences in Teaching) Workshop, Lexington, KY; August 2011
Multiple Professional Development Sessions and Panel Discussions Attended.

Supervision of Student Research/Project(s)
MATH 494, Senior Seminar II; Spring 2014: Kayla Schaffer, Modeling Earth's Climate
Central Michigan University NSF Research Experience for Undergraduates; Summer 2013
Kelsey Marcinko (Whitworth University) Catherine Schepp (Haverford College), Modeling Temperature in Lake Mead
Results were presented by students a regional conferences. Student presenter received Outstanding Presentation Award at the MAA Undergraduate Poster Session, Joint Mathematics Meetings, Baltimore, MD, January 2014.
MATH 494, Senior Seminar II; Spring 2013: Randon Tompkins, Mathematics of Solar Power
MATH 494, Senior Seminar II; Spring 2012: Mark Douglass, Animal

Scholarship and Creative Work, 2003-Present:
Scholarship Related to Discipline

Journal Articles
Driskell, Lisa and Malagon, Audrey. Keychain Ziplines: A practical way to study velocity in the calculus classroom, PRIMUS, 23(7), (2013).
Driskell, Lisa. Wavelet-based steganography, *Cryptologia*, XXVIII(2), 157-174; 2004.

Conference Presentations
Keychain Ziplines: A practical way to study velocity in the calculus classroom. *Joint Mathematics Meetings*, San Diego, CA; January 2012.

A piecewise-defined two-variable model for cardiac tissue, *Society for Industrial and Applied Mathematics Conference on Applications of Dynamical Systems,* Snowbird, UT; May 2011.

Invited Presentations
Central Michigan University, Mount Pleasant, MI; June 2013
Grand Valley State University, Allendale, MI; June 2013
Valparaiso University, Valparaiso, IN; July 2010

Other Presentations
CMU Mathematics Colloquium; November 2013
CMU Physics Seminar; October 2013
CMU Mathematics Colloquium; October 2012
CMU Mathematics Colloquium; Fall 2013

Unpublished research
Driskell, Lisa. A piecewise-defined two-variable model for cardiac tissue, in preparation.
Driskell, Lisa; Marcinko, Kelsey; Schepp, Catherine. Modeling temperature in Lake Mead.

Professional Memberships
Mathematical Association of America; 2011 -- present
Society for Industrial and Applied Mathematics; 2008 -- 2010, 2011, 2013
Association for Women in Mathematics; 2006 -- 2010
American Mathematical Society; 2004 -- 2010

Service 2003-Present:

Profession

Referee/Reviewer; PRIMUS: Problems, Resources, and Issues in Mathematics Undergraduate Studies; 2014-present
Referee/Reviewer; SIMIODE: Systematic Initiative for Modeling Investigations and Opportunities with Differential Equations; 2013-present
SIMODE Board of Contributing Advisors; 2013-present
McGraw-Hill electronic precalculus focus group; January 2014
Application Review Committee fro Central Michigan University NSF Research Experience for Undergraduates; Spring 2013
Co-Organizer; MathFest Project NExT Panel; August 2012
Co-Organizer; Joint Mathematics Meetings Project NExT Panel; January 2012
Co-Chair; mathematical Association of America Rocky Mountain Section Meeting Contributed Papers Session; April 2011

University

Undergraduate Curriculum Committee; Fall 2014 - present
Essential Learning Committee; 2014 - present
HR Committee of Affirmative Action Representatives; 2014- present
Student Showcase Planning Committee; Spring 2014
Chair, Library Committee; 2013 - present
Library Committee; 2012-2013

Department

Math Club Faculty Advisor; 2010 - present
Early Scholars Mathematics Faculty Liaison and Committee; Fall 2013 - present
Mathematics Program Review Committee; Spring 2014-Fall 2014
Search Committee, Instructor of Mathematics Education; Summer 2014
Early Scholars Mathematics Faculty Liaison and Committee; Fall 2013 - present
Calculus Textbook Committee; Spring 2014
College Math Textbook Committee; Spring 2013
Committee on Mathematics Student Learning Objectives; 2012-2013
Search Committee, Instructor of Statistics, Montrose Campus; 2011-2012
Search Committee, Instructor of Mathematics Education; 2010-2011
Calculus Textbook Committee; Spring 2011

Community

Event Coordinator; 17th Annual Math Extravaganza; 2014-2015
Instructor at Summer Honors Program (for gifted high school students) in Holdrege, NE; Summer 2014
Event Coordinator; 16th Annual Math Extravaganza; 2013-2014
Event Coordinator; 15th Annual Math Extravaganza; 2012-2013
Event Coordinator; 14th Annual Math Extravaganza; 2011-2012
Assistant Event Coordinator; 13th Annual Math Extravaganza; 2010-2011

Advising 2003-Present:

University level

SOAR Sessions; 2 per year, 2011-present

Mesa Experience Sessions; 1 per year, 2011-present

Mav Scholar Sessions; 1 per year, 2011-present

Club Advisor; Math Club, 2010-present

Department level

Advisor; number of advisees vary by year

Math Mania; evening events for students in the major; at least 2 per year; 2012-present

Honors and Awards 2003-Present:

CMU Faculty Professional Development Grant; 2013-2014
CMU Professional Development Grant; 2012-2013
Mathematics Association of America Project NeXT Fellow; 2011-2012
AMS Graduate Student Travel Grant to the Joint Mathematics Meetings 2010

Professional Experience:

Instructor at Summer Honors Program (for gifted high school students) in Holdrege, NE; Summer 2014

Faculty Research Advisor at Central Michigan University National Science Foundation Research Experience for Undergraduates; Summer 2013

Please record the number "items/events" you have listed above in the following categories.
If you specify items/events under "other," please provide an explanation/definition.

0	**Books**	0	**Book Reviews**	0	**Creative Publications**
1	**Journal Articles**	0	**Performances**	0	**Patents**
2	**Conference Presentations**	0	**Exhibitions**	0	**Grants-funded and non-funded**
0	**Sabbaticals**	0	**Fullbright**	0	**Book Chapter**
0	**Other (related to discipline)**				

Name:

Marc M Fischer

Start Year: 2011

Program:
Mathematics

Department:
Computer Sciences, Mathematics, and Statistics

COLORADO MESA UNIVERSITY

Full-time Faculty Vita

Faculty Rank

○ Professor ○ Assistant Professor

○ Associate Professor ◉ Instructor

Highest Degree

MS	Ruhr Universitat Bochum -- Bochum, Germany	Mathematics	2011

Education: (List all degrees beginning with most recent-include post docs and external certificates)

MS, Mathematics, Ruhr Universitaet Bochum, 2011

BS, Mathematics, Mesa State College, Grand Junction, CO, 2004

Teaching 2003-Present:

Courses Taught

MATH 110 College Math
MATH 113 College Algebra
MATH 119 Precalculus
MATH 121 Calculus for Business
MATH 135 Engineering Calculus I
MATH 146 Calculus for Biological Sciences
MATH 151 Calculus I
MATH 152 Calculus II

CSCI 106 Web Page Design
CSCI 130 Introduction to Engineering Computer Science

Scholarship and Creative Work, 2003-Present:

Service 2003-Present:

Advising 2003-Present:

Advisor for senior research project Spring 2014

Honors and Awards 2003-Present:

Professional Experience:

Teacher at Elsa-Brandstrom Gymnasium (High School) 2011

Please record the number "items/events" you have listed above in the following categories.
If you specify items/events under "other," please provide an explanation/definition.

0	**Books**	0	**Book Reviews**	0	**Creative Publications**
0	**Journal Articles**	0	**Performances**	0	**Patents**
0	**Conference Presentations**	0	**Exhibitions**	0	**Grants-funded and non-funded**
0	**Sabbaticals**	0	**Fullbright**	0	**Book Chapter**
0	**Other (related to discipline)**				

Name:

Theresa L Friedman

Start Year: 2002

Program:
Mathematics

Department:
Computer Sciences, Mathematics, and Statistics

COLORADO MESA UNIVERSITY

Full-time Faculty Vita

Faculty Rank

(•) Professor ( ) Assistant Professor

( ) Associate Professor ( ) Instructor

Highest Degree

PhD	Lehigh University	Mathematics	1998

Education: (List all degrees beginning with most recent-include post docs and external certificates)

Ph.D, Mathematics, Lehigh University, 1998

M.S., Mathematics, Lehigh University, 1994

B.S., Mathematics, St. Joseph's University, 1992

Teaching 2003-Present:
Courses Taught
MATH 110, College Mathematics

MATH 113, College Algebra

MATH 119, Precalculus

MATH 130, Trigonometry

MATH 149, Honors Mathematics

MATH 151, Calculus I

MATH 151 H, Honors Calculus I

MATH 152, Calculus II

MATH 240, Introduction to Advanced Mathematics

MATH 394, Mathematics Colloquium

MATH 420, Introduction to Topology

MATH 450, Complex Variables

MATH 452, Introduction to Real Analysis I

MATH 453, Introduction to Real Analysis II

MATH 484, Senior Seminar I

MATH 490, Abstract Algebra I

MATH 491, Abstract Algebra II

MATH 494, Senior Seminar II

MATH 496, Topics in Combinatorics & Graph Theory

Evidence of Continuous Improvement
Attended CMU Faculty Professional Development Workshop, Leslie Meyers; August 2014

Completed a MOOC at the Santa Fe Institute: Introduction to Complexity Theory, Fall 2013

Attended CMU Teacher 2 Teacher Workshop; November 2013

Attended CMU Faculty Professional Development Workshop (The NeXt Generation), Mark Taylor; October 2013

Attended CMU Teacher 2 Teacher Workshop; April 2013

Participated in a two-day focus group to consider how to improve online homework system, February 2013

Attended CMU Faculty Professional Development Workshop, Dr. Paul Gaston; January 2013

Attended CMU Teacher 2 Teacher Workshop; December 2012

Attended CMU Faculty Professional Development Workshop, Ken Bain; August 2012

Attended CMU Faculty Professional Development Workshop (Lumina Profiles), Dr. Paul Gaston; January 2012

Project NExT Fellow: 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, ongoing participation.

Attended many sessions including "Experiences that Enrich the Education of Mathematics Majors" and "My Most Successful Math Club Activity," AMS-MAA Joint Meetings, CA, January 2010

Attended many sessions including "College Algebra: Concepts, Data, and Models," "Research and Professional Development Activities for Math Majors," and "Assessment of Student Learning in Undergraduate Mathematics," AMS-MAA Joint Meetings, CA. January 2008

Attended many sessions including the "Mathematics Education" Session, Rocky Mountain MAA Section Meeting, Pueblo, CO, April 2007

Attended many sessions including "Getting Students to Discuss and to Write about Mathematics" and "Teaching Innovations in Real Analysis," AMS-MAA Joint Meetings, LA, January 2007

Attended many sessions including "Combinatorics" and "Math and the Arts," AMS-MAA Joint Meetings, AZ, January 2004

"Renewal of College Algebra" Workshop; MAA National Meeting, Albuquerque, NM: August 2005.

"Fair Division" Workshop; AMS-MAA Joint Meetings, AZ: January 2004.

Innovative Materials/Activities
Flipped Classroom in MATH 240, MATH 452, and MATH 453
Journals in MATH 240
Honors Projects in MATH 151H
Group Work in all classes
Reading Quizzes in MATH 151 and MATH 152

Supervision of Student Research/Project(s)

Zero-Divisor Graphs of Rings, presented by Rachael Alvir, April 2014
Mathematics Colloquium, Colorado Mesa University

Chaotic Dynamics in Complex Systems and an Exploration of the Mandelbrot Set, presented by Robby Tabuchi, April 2013
Mathematics Colloquium and Student Showcase, Colorado Mesa University

An Introduction to Cryptography, presented by Lukas Landing and Rebecca Schmelzer, April 2012
Student Showcase, Colorado Mesa University

The Fundamental Group of the Circle, presented by David Miller, April 2010
Mathematics Colloquium, Mesa State College

Greedy Algorithms, presented by Michael Kitzman, May 2007
Mesa State Student Scholar Symposium & Mathematics Colloquium, Mesa State College

Cover Pebbling the Kneser Graphs, presented by Chris Mowrer, November 2004
Mathematics Colloquium, Mesa State College; **Supported by Dixson Mentor and Scholar Award: 2004 -2005**

An Improved Upper Bound for Optimal Pebbling, presented by Stephanie Johnson, April 2004
Mathematics Colloquium, Mesa State College

Reaching the Vertices: One Pebble at a Time, presented by Chris Mowrer, April 2004
Mesa State College Student Scholar Symposium

Underneath It All, presented by Michelle Murray, April 2004
Mesa State Student Scholar Symposium

The Center of Art, presented by Natalie Puckett, August 2003
MAA National Meeting, CO; **Awarded Outstanding MAA Talk**

Cut the Cake and Eat It Too!, presented by Chris Mowrer, April 2003
Mesa State Student Scholar Symposium

Music and Continued Fractions, presented by Jesse Balaz and Isaac Oboka, April 2003
Mesa State Student Scholar Symposium

Scholarship and Creative Work, 2003-Present:
Scholarship Related to Discipline

Journal Articles
Combinatorial Identities by Way of Wilf's Multigraph Model, with P. Klingsberg, International Journal of Mathematics and Mathematical Sciences Vol. 2006, Article ID 96327, 2006.

Conference Presentations
Optimal Pebbling, January 2004
AMS-MAA Joint Meetings, AZ (Abstract published in AMS proceedings.)

Book reviews
Reviewer for the 1st edition Rhonda Huettenmueller College Algebra text (full text review), 2008

Reviewer for the Salas, Hille, and Etgen Calculus text, 2005

Other
Colloquium Presentations
Infinity: Some Delightful Problems and Parodoxes, October 2013
Mathematics Colloquium, Colorado Mesa University

The Dinitz Conjecture, February 2012
Mathematics Colloquium, Colorado Mesa University

So... You Think Differentiability Implies Continuity?, October 2010
Mathematics Colloquium, Mesa State College

Mathematics and the Mystery of Infinity, January 2005
Mathematics Colloquium, Mesa State College

Scholarship Related to Pedagogy in Discipline

Conference Presentation

Math Extravaganza!, January 2010
AMS-MAA Joint Meetings, CA (Abstract published in AMS proceedings.)

A Professional Skills Preparation for the Senior Research Experience, January 2008
AMS-MAA Joint Meetings, CA (Abstract published in AMS proceedings.)

Modeling-Oriented College Algebra, April 2007
Rocky Mountain MAA Section Meeting, Pueblo, CO

Teaching College Algebra from a Modeling Perspective, January 2007
AMS-MAA Joint Meetings, LA (Poster presentation)

Book Chapters

Modeling-Oriented College Algebra at Mesa State College, with C. Bonan-Hamada, Partner Discipline Recommendations for Introductory College Mathematics and the Implications for College Algebra, MAA, 2011.

Other

Organized and Led Invited Workshop: "How to Cultivate a Successful Undergraduate Research Program." MAA Regional Meeting, Mesa State College: April 2006.

Other:
Grants

MAA "Renewal of College Algebra" Grant; $2000; Support for Final Report; Fall 2008

Selected participant in the Mathematical Association of America's NSF Grant "Renewal of College Algebra;" $5000 awarded to Mesa State College; Co-director at Mesa State College; 2005 - 2006

Unpublished Research

Zero-divisor Graphs of Rings, with R. Alvir, in preparation
Optimal Pebbling in Paths and Cycles, with C. Wyels, Unpublished manuscript, 2003.

Professional Memberships
Mathematical Association of America
Sigma Xi Scientific Research Society
Pi Mu Epsilon Honor Society
Kappa Mu Epsilon Honor Society

Service 2003-Present:

University

Teacher to Teacher Professional Development Planning Committee, Fall 2011 - present

Who's Who Selection Committee, Spring 2013 - present

Honors Committee, Spring 2013-Fall 2013

Chair, Committee to Study Faculty Overloads, Spring 2013

Higher Learning Commission Accreditation Committee (Integrity Subcommittee), Fall 2011 - Fall 2013

Quality Matters Committee for Online and Distance Instruction, Fall 2011 - Spring 2012

Faculty Senator, Fall 2008 - Spring 2012
Vice-President, Fall 2011 - Spring 2012

Parking Services Committee, Spring 2007 - present

Student Orientation Advisor, ongoing as needed

Learning Management System Selection Committee, Fall 2010-Spring 2011

Mesa Experience Faculty Consultant, Fall 2008; Fall 2010

Chair, Academic Policies Committee, Fall 2006 - Spring 2008

Department

Program Review Committee, Spring 2014-present

Textbook Selection Committee Chair: Precalculus, Spring 2013

Chair, CSMS Online Instruction Users Group, Fall 2011 - Spring 2012

Student Success Subcommittee, Fall 2011 - Spring 2012

Faculty Mentor, Fall 2010 - present

Pre-tenure Committee, Fall 2009 - present
Chair, Fall 2009 - September 2011

Math Extravaganza! Faculty Coordinator, Fall 2005 - Spring 2011

Course Substitution Review Committee, Fall 2004 - Spring 2011

Math Club Advisor, Fall 2004 - Spring 2010

Search Committee: Mathematics Tenure-Track Position, Fall 2009 - Spring 2010

Curriculum Reorganization Committee, Fall 2007 - Spring 2008

Textbook Selection Committee: Introduction to Advanced Mathematics, Spring 2006

Search Committee: Mathematics Tenure-Track Position, Fall 2005-Spring 2006

Chair, Travel Award Committee, Fall 2004 - Spring 2007

Committee to develop Faculty Evaluation Guidelines for CSMS Department, Fall 2004

Chair, Senior Seminar Committee, Spring 2004 - Fall 2004
Developed plan for revised course and wrote curriculum committee proposal

Chair, Mathematics (six year) Program Review Committee, Fall 2003 - Spring 2004

Textbook Selection Committee: Precalculus, Spring 2004

Textbook Selection Committee: Beginning and Intermediate Algebra, Spring 2004

Textbook Selection Committee: Calculus, Spring 2011, Spring 2008, Spring 2003

Committee to review remedial courses, Spring 2003

Community
Regional
Chair and Organizer of the Rocky Mountain Section MAA Conference (April 2016), Spring 2014 - present

MAA Regional Conference Planning Committee, Fall 2005 - Spring 2006

MAA (regional) Nominating Committee, Fall 2003 - Spring 2006
Chair, Fall 2004 - Spring 2005

Advising 2003-Present:

University level
Participant in approximately 2-4 advising activities per year (SOR, Mesa Experience, Mav Scholars)

Department level
Student Advisor - 3-10 students

Honors and Awards 2003-Present:

Local
MSC Outstanding Achievement in Advising Award, 2008

Dixson Scholar and Mentor Award, 2004-2005

Professional Experience:

Please record the number "items/events" you have listed above in the following categories.
If you specify items/events under "other," please provide an explanation/definition.

	Books	2	**Book Reviews**		**Creative Publications**
1	**Journal Articles**		**Performances**		**Patents**
5	**Conference Presentations**		**Exhibitions**	3	**Grants-funded and non-funded**
	Sabbaticals		**Fullbright**	1	**Book Chapter**
2	**Other (related to discipline)**	Colloquium presentations			

Name:

Darren E Gemoets

Start Year: 2013

Program:
Mathematics

Department:
Computer Sciences, Mathematics, and Statistics

COLORADO MESA UNIVERSITY

Full-time Faculty Vita

Faculty Rank

○ Professor ◉ Assistant Professor

○ Associate Professor ○ Instructor

Highest Degree

PhD	University of Wyoming	Statistics	2013

Education: (List all degrees beginning with most recent-include post docs and external certificates)

Ph.D., Statistics, University of Wyoming, 2013

M.S., Mathematics, Montana State University--Bozeman, 1998

B.S., Mathematics, Fort Lewis College, Durango, CO, 1996

Teaching 2003-Present:

Courses Taught

MATH 113, College Algebra

STAT 200, Probability and Statistics

STAT 215, Statistics for Social and Behavioral Sciences

STAT 311, Statistical Methods

STAT 313, Sampling Techniques

Evidence of Continuous Improvement

Attended seminar on the VALUES Rubric project presented by Dr. Terry Rhodes. Colorado Mesa University. 1/16-1/17/2014.

Innovative Materials/Activities

Guest lecture on using statistical software in MATH 494, Senior Seminar.

Use of the advanced statistical software package R in STAT 311.

Supervision of Student Research/Project(s)

2013: Three students working on projects for MATH 494, Senior Seminar

Scholarship and Creative Work, 2003-Present:

Scholarship Related to Discipline

Journal Articles

Gemoets, D.E., Barber, J., Ogle, K. 2013. "Reversible jump MCMC for inference in a deterministic individual-based model of tree growth for studying forest dynamics". Environmetrics 24(7): 433-448. DOI: 10.1002/env.2239

Conference Presentations

"A brief introduction to Bayesian statistical methods". CMU Mathematics Colloquium. 10/25/2013.

"Reversible jump MCMC for inference in a deterministic individual-based model of tree growth for studying forest dynamics." University of Wyoming Statistical Seminar Series. Laramie, WY. 11/20/2009.

"Bayesian parameter estimation in partial differential equation models." Joint Statistical Meetings. Washington, DC. 8/3/2009.

"Using WebCT to supplement the Wyoming equality network." Wyoming Distance Education Consortium. Powell, WY. 5/24/2005.

"Strategies for teaching developmental mathematics online." Wyoming Distance Education Consortium. Powell, WY. 5/24/2005.

Professional Memberships

American Statistical Association -- 2008-Present

Institute of Mathematical Statistics -- 2008-Present

Service 2003-Present:

University

Scholarship Committee -- 2013-Present

Department

Mathematics Program Review Committee -- 2013-Present

Advising 2003-Present:

University level

2013

Mesa Experience Sessions: 1

Major Fair Sessions: 1

Honors and Awards 2003-Present:

Professional Experience:

Please record the number "items/events" you have listed above in the following categories.
If you specify items/events under "other," please provide an explanation/definition.

	Books	**Book Reviews**	**Creative Publications**
1	**Journal Articles**	**Performances**	**Patents**
4	**Conference Presentations**	**Exhibitions**	**Grants-funded and non-funded**
	Sabbaticals	**Fullbright**	**Book Chapter**
	Other (related to discipline)		

TIMOTHY P. GRAUS

1229 O ½ Road, Loma, CO 81524 (970) 589-5256

EDUCATION:

1997-Present — 48 hours additional graduate credits from Adams State College, Portland State Univ., Colorado State Univ., Univ. of Colorado at Denver, CSU Pueblo, CO School of Mines, and Mesa State College.

1991-1994 — Auburn University; Auburn, AL
Master of Applied Mathematics
(Combinatorics and Discrete Math) -Awarded March 1994-

1987-1991 — Auburn University; Auburn, AL
Bachelor of Science in Secondary Education - Mathematics
(Summa Cum Laude) -Awarded June 1991-
I hold a Colorado Teaching License

WORK EXPERIENCE:

1999-Present — High School Math Teacher - Fruita Monument High School, Fruita, CO
I have taught a wide variety of math classes ranging from remedial math through AP Calculus. Designed, implemented, and taught an Integrated Math curriculum for four years. Developed digital lesson plans on Powerpoint for most of my math courses. Led the Math Department as Chairperson for seven years and sponsored both the Math club and the EPYCS Club (El Pomar Youth in Community Service).

1996-1999 — Middle School Math Teacher at Holy Family School, Grand Jct., CO
Responsible for all middle school math classes (roughly 125 students) - taught 6th Grade, 7th Grade, Algebra and Pre-algebra as well as various elective classes. Sponsor of school MATHCOUNTS program - after-school math club. Wrote middle school math curriculum and chose new textbooks during first year. Active on technology committee - implemented upgrade of computer lab from DOS to Windows environment and taught several computer classes. Assistant track coach last two years. Completed an induction program during 97-98 school year.

Summer 1998 — Audio Production for On Hold Productions, Grand Junction, CO
Digitally recorded, edited, and mixed together promotional audio "commercials" for local and national companies to play over phone systems while customers wait on hold.

TIMOTHY P. GRAUS

1229 O ½ Road, Loma, CO 81524 (970) 589-5256

1996 — Temporary Help for Mesa County District Attorney, Grand Jct., CO
Performed various duties in the office to assist different branches of the D.A.'s operations. Helped with computer system, including new database for District Court felony cases. Also performed clerical duties as needed.

1995 — Technical Support at Softshell International, Grand Junction, CO
Problem solving for domestic and international customers using the company's chemistry drawing software and other scientific software on DOS/Windows and Macintosh systems. Released due to company downsizing.

1991-1994 — Youth Minister at Auburn First Baptist Church, Auburn, AL
Responsibility for planning and implementing a total youth program while developing relationships with youth for the purpose of encouraging spiritual growth and service to others. Developed and administered annual budgets of $5000+. Organized and led more than ten weekend retreats for groups of up to 30 people.

1991-1994 — Graduate Teaching Assistant at Auburn University, Auburn, AL
Taught introductory math courses such as College Algebra, Calculus, and Business Calculus to students at the undergraduate level.

1988-1990 (Summers) — Counselor at Alabama Baptist Boys Camp, Talladega, AL
Led boys (ages 12 - 16) through group building activities, hiking, adventure recreation/ropes and confidence course. Some training in rock climbing and rappelling. Counselor of the Year - 1990.

ACADEMIC / PROFESSIONAL ASSOCIATIONS AND HONORS:

Phi Kappa Phi National Honor Society
National Merit Scholarship
Auburn University Presidential Scholarship

HOBBIES & INTERESTS:

Soccer referee up to the High School level, softball, volleyball, skiing, biking, hiking. Music - church and community handbell choir; Web publishing and video production. Computers - Experience with a variety of applications software, programming in *PASCAL* and C, and familiarity with HTML, and INTERNET applications.

REFERENCES AVAILABLE UPON REQUEST

Name:

Philip E Gustafson

Start Year: 1998

Program:
Mathematics

Department:
Computer Sciences, Mathematics, and Statistics

COLORADO MESA UNIVERSITY

Full-time Faculty Vita

Faculty Rank

(•) Professor ( ) Assistant Professor

( ) Associate Professor ( ) Instructor

Highest Degree

PhD	Washington State University	Mathematics	1994

Education: (List all degrees beginning with most recent-include post docs and external certificates)

Ph.D., Mathematics, Washington State University, 1994

M.S., Mathematics, Washington State University, 1990

B.S., Mathematics, State University of New York, College at Oneonta, 1988

Teaching 2003-Present:

Courses Taught
MATH 110 College Mathematics
MATH 113 College Algebra
MATH 119 Precalculus
MATH 146 Calculus for Biology
MATH 151 Calculus I
MATH 152 Calculus II
STAT 200 Probability and Statistics
MATH 240 Introduction to Advanced Math
MATH 236 Differential Eqns & Linear Algebra
MATH 260 Differential Equations
MATH 325 Linear Algebra
MATH 361 Numerical Analysis
MATH 362 Fourier Analysis
MATH 365 Mathematical Modeling
MATH 369 Discrete Structures I
MATH 394 Mathematics Colloquium
MATH 395 Independent Study
MATH 396 Topics
MATH 397 Structured Research
MATH 460 Linear Algebra II

Evidence of Continuous Improvement

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

Attended numerous pedagogical and research sessions at the Joint Mathematics Meetings of the AMS-MAA, January 2013.

Session Co-Organizer: *Mathematics Experiences In Business, Industry And Government,* MAA Contributed Paper Session, Joint AMS-MAA Meetings, January 2013.

Attended numerous pedagogical and research sessions at the Joint Mathematics Meetings of the AMS-MAA, January 2012.

Session Co-Organizer: *Mathematics Experiences In Business, Industry And Government,* MAA Contributed Paper Session,

Joint AMS-MAA Meetings, January 2012.

Attended numerous pedagogical and research sessions at the Joint Mathematics Meetings of the AMS-MAA, January 2011.

Session Co-Organizer: *Mathematics Experiences In Business, Industry And Government,* MAA Contributed Paper Session, Joint AMS-MAA Meetings, January 2011.

Attended numerous pedagogical and research sessions at the Joint Mathematics Meetings of the AMS-MAA, January 2010.

Session Chair and Co-Organizer: *Mathematics Experiences In Business, Industry And Government,* MAA Contributed Paper Session, Joint AMS-MAA Meetings, January 2010.

Attended numerous pedagogical and research sessions at the Joint Mathematics Meetings of the AMS-MAA, January 2009.

Session Chair and Co-Organizer: *Mathematics Experiences In Business, Industry And Government,* MAA Contributed Paper Session, Joint AMS-MAA Meetings, January 2009.

Attended numerous pedagogical and research sessions at the Joint Mathematics Meetings of the AMS-MAA, January 2008.

Session Chair and Co-Organizer: *Mathematics Experiences In Business, Industry And Government,* MAA Contributed Paper Session, Joint AMS-MAA Meetings, January 2008.

Attended numerous pedagogical and research sessions at the Joint Mathematics Meetings of the AMS-MAA, January 2007.

Session Chair and Co-Organizer: *Mathematics Experiences In Business, Industry And Government,* MAA Contributed Paper Session, Joint AMS-MAA Meetings, January 2007.

MAA PREP (Professional Enhancement Programs) workshop, "Wavelets and Applications: A Multidisciplinary Undergraduate Course with an Emphasis on Scientific Computing," June 2006.

Attended numerous pedagogical and research sessions at the Joint MAA Rocky Mountain and Intermountain Section Meetings, April 2006.

Attended numerous pedagogical and research sessions at the Joint Mathematics Meetings of the AMS-MAA, January 2006.

Session Chair and Co-Organizer: *Mathematics Experiences In Business, Industry And Government,* MAA Contributed Paper Session, Joint AMS-MAA Meetings, January 2006.

Attended numerous pedagogical and research sessions at the Joint Mathematics Meetings of the AMS-MAA, January 2005.

Session Chair and Co-Organizer: *Mathematics Experiences In Business, Industry And Government,* MAA Contributed Paper Session, Joint AMS-MAA Meetings, January 2005.

Attended numerous pedagogical and research sessions at the Joint Mathematics Meetings of the AMS-MAA, January 2004.

Session Chair and Co-Organizer: *Mathematics Experiences In Business, Industry And Government,* MAA Contributed Paper Session, Joint AMS-MAA Meetings, January 2004.

Attended numerous pedagogical and research sessions at the Joint Mathematics Meetings of the AMS-MAA, January 2003.

Session Chair and Co-Organizer: *Mathematics Experiences In Business, Industry And Government,* MAA Contributed Paper Session, Joint AMS-MAA Meetings, January 2003.

MAA Project NExT Fellow, 1995 - Present; Project NExT Consultant and Mentor, 2007 - Present. Participate in e-mail and conference-based discussions regarding New Experiences in Teaching.

Innovative Materials/Activities

Development and delivery of a new and timely course. I authored all course materials for a new course at Colorado Mesa University, MATH 362 Fourier Analysis, including textbook, lesson plans, homework problems, projects, computer programs. Students receive exposure to topics central to audio and image technology, working with both the mathematics and hands-on applications.

Mentor for projects in MATH 365 Mathematical Modeling and in MATH 362 Fourier Analysis.

Supervision of Student Research/Project(s)

Holograms and Fourier Analysis, Clint Anderson, Phil Gustafson, MATH 484/494 Senior Seminar Presentation, CSMS Colloquium, Colorado Mesa University, April 2012.

Holograms and Fourier Analysis, Clint Anderson, Phil Gustafson, Student Scholar's Symposium, Colorado Mesa University, April 2012.

MP3 Compression, Gordon Gibson, Phil Gustafson, MATH 484/494 Senior Seminar Presentation, CSMS Colloquium, April 2011.

MP3 Compression, Gordon Gibson, Phil Gustafson, Student Scholar's Symposium, Colorado Mesa University, Student Scholars Symposium, April 2011.

Mathematics of JPEG Compression, Heidi Chynoweth, Phil Gustafson, MATH 484/494 Senior Seminar Presentation, CSMS Colloquium, , April 2010.

Wavelets and Image Compression, Heather Thomas, Phil Gustafson, MATH 484/494 Senior Seminar Presentation, CSMS Colloquium, May 2008.

Computational Fluid Dynamics, Matthew Seymour, Phil Gustafson, MATH 484/494 Senior Seminar Presentation, CSMS Colloquium, May 2007.

Modeling Los Angeles Smog, Benjamin Blehm, Phil Gustafson, MATH 484/494 Senior Seminar Presentation, CSMS Colloquium, December 2005.

Mathematical Models in Aerodynamics, Jake Lewis, Phil Gustafson, Senior Seminar Presentation, CSMS Colloquium, May 2005.

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.

Scholarship and Creative Work, 2003-Present:
Scholarship Related to Discipline

Journal Articles

A Brief History of the BIG SIGMAA, Phil Gustafson, The BIG SIGMAA Newsletter (Business, Industry an Government Special Interest Group of the MAA), Vol. 9, No. 2, 2013.

BIG Mathematical Experiences at the JMM, Phil Gustafson, Carla D. Martin, MAA Focus, Vol. 30, Number 2, February-March 2010.

BIG Events at the JMM, Phil Gustafson, MAA Focus, Vol. 29, Number 2, February-March 2009.

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.

Mathematics Experiences in Business, Industry and Government, Phil Gustafson, MAA Focus, Vol. 28, Number 3, March 2008.

Orthogonal Rational Expansions of Functions using Laurent Gaussian Quadrature Rules with Numerical Examples, Philip E. Gustafson, Communications in the Analytic Theory of Continued Fractions, Vol. 15, 2007.

Mathematics Experiences in Business, Industry and Government, Phil Gustafson, MAA Focus, March 2007.

Mathematics Experiences in Business, Industry and Government, Phil Gustafson, MAA Focus, March 2006.

Mathematics Experiences in Business, Industry and Government, Phil Gustafson, MAA Focus, March 2005.

Mathematics Experiences in Business, Industry and Government, Phil Gustafson, MAA Focus, March 2004.

How to Pack Lunch for a Mars Mission, and other BIG Math Projects, Phil Gustafson, MAA Focus, June 2003.

Conference Presentation

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

Student Projects using Microphones and the FFT, Phil Gustafson, AMS-MAA Meetings, San Diego, January 2013.

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

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

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

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

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

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

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

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

Spectral Analysis: Math and Music, Keynote Presentation (invited), 12th Annual Math Extravaganza, Mesa State College, February 2010.

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

January 2010.

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.

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

Technical Reports

Student Projects using Microphones and the FFT, Phil Gustafson, Abstracts of Papers Presented to the American Mathematical Society, Vol. 34, No. 1, 2013.

Student Voice Waves: Investigations using Calculus and Freeware, Phil Gustafson, Abstracts of Papers Presented to the American Mathematical Society, Vol. 33, No. 1, 2012.

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.

Portable Haar Wavelet Projects with MATLAB, Phil Gustafson, Abstracts of Papers Presented to the American Mathematical Society, Vol. 31, No. 1, 2010.

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.

Referee: *Strong Stieltjes distributions and orthogonal Laurent polynomials with applications to quadratures and Padé approximations*, for Applied Mathematics Letters, January 2004.

Scholarship Related to Pedagogy in Discipline

Books

Manuscript preparation - Fourier Analysis: An Applied Calculus Approach with Applications to Image and Audio Compression; revisions in progress.

Journal Articles

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.

Conference Presentation

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

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

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

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

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

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

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

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

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

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

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.

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

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

PowerPoint as a Presentation Tool in a Differential Equations Course, Philip E. Gustafson, AMS-MAA Meetings, Atlanta, GA, January 2005.

Math vs. Movie Monsters, Mathematics Colloquium, Department of Mathematics, Computer Science and Statistics, Mesa State College, September 2004.

Book reviews

Discrete Fourier Analysis and Wavelets: Applications to Signal and Image Processing, S. Broughton, K. Bryan (Wiley 2009), MAA Online Reviews, April 2009.

Continued Fractions Volume 1: Convergence Theory, 2nd Edition, Lorentzen and Waadeland, Atlantis Press/World Scientific, February 2008.

Calculus, by Briggs and Cochran, Pearson Publishing, October 2008.

Mathematical Modeling with Excel, Brian Albright, Jones and Bartlett Publishers, July 2008.

Calculus, by Briggs and Cochran, Pearson Publishing, October 2007.

Technical Reports

Student Voice Waves: Investigations using Calculus and Freeware, Phil Gustafson, Abstracts of Papers Presented to the American Mathematical Society, Vol. 33, No. 1, 2012.

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.

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. 30, No. 1, 2008.

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.

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

Grant Work
USDE No Child Left Behind / Colorado Commission on Higher Education: Aligning Practices and Standards, August 2003 - May 2004. Served as PI for this project after grant author and PI (Dr. Todd Shockey) resigned position at MSC.

Sabbaticals
Fall 2005: Fourier Analysis Applied to Sound Waves and Image Processing

Professional Memberships
Mathematical Association of America (MAA)
Business, Industry and Government Special Interest Group of the MAA (BIG SIGMAA)
Environmental Mathematics SIGMAA (2003 - 2008)
Kappa Mu Epsilon
Sigma Pi Sigma

Service 2003-Present:

University
CMU Tenure and Promotion Committee, CSMS Representative, Fall 2011 - Present.

Student Showcase Committee, CSMS Representative, Fall 2010 - Fall 2013.

CMU Distinguished Faculty Awards Committee, Fall 2011 - Present

Panelist, New to CMU Teaching Effectiveness Panel, CMU, August 13, 2012.

CMU Career Fair, Math Representative, October 2011

MavScholars Representative, CSMS, September 24, 2010.

Mesa Experience Representative, CSMS, October 2009.

Commencement Marshall, May 2008.

College Honors and Recognition Committee, 2002 - 2006

Curriculum Committee, 2002 - 2005

Teacher Education Advisory Council, Fall 03 - Fall 05

Chair, Curriculum Subcomittee Program Review: AA Early Childhood Education, Spring 2004.

Chair, Curriculum Subcomittee Program Review: B.A. Psychology, Spring 2003.

Department

Chair, CSMS Course and Curriculum Development (MATH 135/136 Engineering Calculus I & II with program modifications for BS Mathematics, Mathematics Minor, Statistics Minor, Fall 2011.

Chair, Calculus Book Search Committee, Spring 2011.

Search Committee, 2010 - 2011, Mathematics Education position.

Search Committee, 2009 - 2010, Mathematics position.

Faculty Mentor, 2010 - Present

Program Review Committee, Mathematics, Fall 2007 - Fall 2009.

MAA Department Liaison, Fall 2008 - Present.

Faculty Sponsor, Kappa Mu Epsilon, Fall 2001-Present, Mathematics Honor Society, MSC Chapter.

Online Course Committee, Spring 2009.

Department Brochure Preparation, Spring 2009, Summer 2010, Fall 2011.

Chair, Mathematics Department Travel Committee, 2007 - 2008.

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.

Chair and Author, Mathematics Minor Program Review, Spring 2004.

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.

National

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

BIG SIGMAA Chair: (Jan 2010 - Jan 2014) Nominated and nationally elected Chair of *Business, Industry and Government Special Interest Group* (BIG SIGMAA), in October 2011, 2009; 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.

Regional
Session Co-Chair, MAA Rocky Mountain Section Meeting, Colorado School of Mines, April 2009.

Session Moderator, Joint MAA Rocky Mountain and Intermountain Section Meetings, Grand Junction, CO, April 2006.

Advising 2003-Present:
University level

Student Advising Sessions (4), 2014

Student Advising Sessions (2), 2013

Student Advising Sessions (4), 2012

Student Advising Sessions (4), 2011

Student Advising Sessions (2), 2009

Student Advising Sessions (2), 2008

Student Advising Sessions, participant, 2003 - 2007.

Department level
Kappa Mu Epsilon Faculty Sponser, 2001 - Present

Adviser for between 5 - 21 students per year in the math, secondary education, and math minor programs, 2003 - Present

Honors and Awards 2003-Present:

Local

Sabbatical, Colorado Mesa University, Spring 2014.

Exemplary Faculty Award, Colorado Mesa University, May 2013.

Exemplary Faculty Award, Colorado Mesa University, May 2012.

Exemplary Faculty Award, Colorado Mesa University, May 2011.

Exemplary Faculty Award, Mesa State College, May 2009.

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.

Professional Experience:

Please record the number "items/events" you have listed above in the following categories.
If you specify items/events under "other," please provide an explanation/definition.

0	**Books**	2	**Book Reviews**	**Creative Publications**
11	**Journal Articles**		**Performances**	**Patents**
21	**Conference Presentations**		**Exhibitions**	**Grants-funded and non-funded**
2	**Sabbaticals**		**Fullbright**	**Book Chapter**
1	**Other (related to discipline)**	Textbook manuscript preparation		

Name:

James P Kavanagh

Start Year: 1994

Program:
Mathematics

Department:
Computer Sciences, Mathematics, and Statistics

COLORADO MESA UNIVERSITY

Full-time Faculty Vita

Faculty Rank

○ Professor ○ Assistant Professor

◉ Associate Professor ○ Instructor

Highest Degree

PhD	University of Wisconsin, Madison	Discipline Mathematics	Year1989

Education: (List all degrees beginning with most recent-include post docs and external certificates)

Ph.D. Mathematics, 1989, University of Wisconsin, Madison, M.Sc. Mathematics, 1976,University College Dublin, National University of Ireland, B.Sc. Mathematical Science, University College Dublin, National University of Ireland

Teaching 2003-Present:

Courses Taught

CSCI 496, Topics
MATH 110, College Mathematics
MATH 113, College Algebra
MATH 119, Precalculus Mathematics
MATH 130, Trigonometry
MATH 151, Calculus I
MATH 152, Calculus II
MATH 240, Introduction to Advanced Mathematics
MATH 253, Calculus III
MATH 260, Differential Equations
MATH 310, Number Theory
MATH325, Linear Algebra I
MATH 352, Advanced Calculus
MATH 394, Mathematics Colloquium
MATH 397, Structured Research
MATH 450, Complex Variables
MATH 452, Intro to Real Analysis I
MATH 453, Intro to Real Analysis II
MATH 460, Linear Algebra II
MATH 496, Topics
PHYS 196 Topics
PHYS 301 Introduction to Space Science
STAT 200, Probability and Statistics
STAT 214, Business Statiosics

Evidence of Continuous Improvement

Colorado Space Grant Consortium Annual Conferences 2003- 2013

Supervision of Student Research/Project(s)

Spring 2014, MATH 484, Senior Seminar II, I supervised a student investigating the Mathematics of Microeconomics. Spring of 2011 PHYS 301, Introduction to Space Science, students build two autonomous robots controlled by stamp computers. A total of seven students participated.

Spring 2010, MATH 484, Senior Seminar II, I supervised a single student investigating the Burnside Two Prime Theorem. This involved integrating ideas from Finite Group Theory, Character Theory and Algebraic Number Theory.
Spring 2009, PHYS 301, Introduction to Space Science, eight students built a solar powered model of a Space Elevator.
Spring 2008, five students built a small, fully autonomous robot vehicle that could traverse a Mars-like terrain, and navigate its way to a radio beacon while avoiding obstacles.
Spring 2006, students completed a project on radio communication with a rocket in flight.
Fall 2006, MATH 484, Senior Seminar II, I supervised a single student investigating Error Correcting Codes.

Spring 2005, MATH 484, Senior Seminar II, one student developed a mathematical model of a commercial fishery.

Scholarship and Creative Work, 2003-Present:
Scholarship Related to Discipline

Conference Presentation
"Functions of Matrices" Mathematical Association of America Rocky Mountain Section annual conference 2004
Book reviews

Technical Reports
2003-2011 Colorado Space Grant Consortium Annual Conferences, reports on student research projects
Book Chapters

Professional Memberships
Mathematical Association of America

Service 2003-Present:
University
2009-present, Graduate Curriculum Committee Vice Chair 2011-present
2009-present, Benefits Committee
2009 present, Pre-tenure Committee
2003-2006 Faculty Senate (President 2004-2005)

Department
2009- present, Pre-tenure Committee
2009 Mathematics Search Committee
2008 Mathematics Program Review Committee
2006 Statistics Search Committee
2006 Mathematics Education Search Committee
2006 CSMS Administrative Assistant Search Committee

Advising 2003-Present:
University level
Student Orientation, Mesa Experience,SOAR

Honors and Awards 2003-Present:
2003-present annual $10,000 NASA Space Grant
2006 $4300 NASA grant for Summer student research Project
2005 $20,000 grant from the Colorado Institute of Technology to develop a Space Science course
2004 $4300 NASA grant for Summer student research Project
Professional Experience:

Please record the number "items/events" you have listed above in the following categories.
If you specify items/events under "other," please provide an explanation/definition.

0	**Books**	0	**Book Reviews**	0	**Creative Publications**
	Journal Articles	0	**Performances**	0	**Patents**
10	**Conference Presentations**	0	**Exhibitions**		**Grants-funded and non-funded**
0	**Sabbaticals**	0	**Fullbright**		**Book Chapter**
	Other (related to discipline)				

Name:

Max L McFarland

Start Year: 2009

Program:
Mathematics

Department:
Computer Sciences, Mathematics, and Statistics

COLORADO MESA UNIVERSITY

Full-time Faculty Vita

Faculty Rank

○ Professor ○ Assistant Professor

○ Associate Professor ◉ Instructor

Highest Degree

ME	University of Colorado - Boulder	Engineering	2003

Education: (List all degrees beginning with most recent-include post docs and external certificates)

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

Scholarship and Creative Work, 2003-Present:

Scholarship Related to Discipline

Books

Journal Articles

Conference Presentation

Book reviews

Technical Reports

Book Chapters

Other

Creative Work Related to Discipline

Performances

Exhibits

Publications

Other:
Grants

Patents

Unpublished research

Sabbaticals

Fullbright

Professional Memberships

Service 2003-Present:
University

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.
National

Regional

Local

Advising 2003-Present:
University level

Department level

Honors and Awards 2003-Present:
National

Regional

Local

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

Performances

Exhibits

Publications

Other:
Grants

Patents

Unpublished research

Sabbaticals

Fullbright

Professional Memberships

Service 2003-Present:
University

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.
National

Regional

Local

Advising 2003-Present:
University level

Department level

Honors and Awards 2003-Present:
National

Regional

Local

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.

Please record the number "items/events" you have listed above in the following categories.

If you specify items/events under "other," please provide an explanation/definition.

Books		**Book Reviews**	**Creative Publications**
Journal Articles	0	**Performances**	**Patents**
Conference Presentations		**Exhibitions**	**Grants-funded and non-funded**
Sabbaticals		**Fullbright**	**Book Chapter**
Other (related to discipline)			

Name:

Clifford L Moore

Start Year: 2001 Fall

Program:
Mathematics

Department:
Computer Sciences, Mathematics, and Statistics

COLORADO MESA UNIVERSITY

Lecturer Vita

Highest Degree

MS	Colorado State University	Industrial Science Education	1972

Education: (List all degrees beginning with most recent-include post docs and external certificates)

MS Colorado State University

BA University Of Northern (Colorado State College)

AA Colorado Mesa University (Mesa Junior College)

Teaching 2003-Present:
Courses Taught Mathematics 090, 091, 110 Stats 200

Evidence of Continuous Improvement

Innovative Materials/Activities

Prior Professional Experience Relevant to Current Position: (Include year(s) of employment, employer, position title and responsibilities)

1962- 1965	Glenwood Springs Colo	Teacher	Teaching 7-12 Math , Industrial Art
1965-1995	School dist. #51 Grand Jct. Colo.	Teacher	Teaching 7-12 Math , Industrial Art

Please record the number "items/events" you have listed above in the following categories.
If you specify items/events under "other," please provide an explanation/definition.

Books	**Book Reviews**	**Creative Publications**
Journal Articles	**Performances**	**Patents**
Conference Presentations	**Exhibitions**	**Grants-funded and non-funded**
Sabbaticals	**Fulbrights**	**Book Chapters**
Other (related to discipline)		

Name:

Richard C Ott

Start Year: 2006

Program:
Mathematics

Department:
Computer Sciences, Mathematics, and Statistics

COLORADO MESA UNIVERSITY

Full-time Faculty Vita

Faculty Rank

○ Professor ○ Assistant Professor

◉ Associate Professor ○ Instructor

Highest Degree

PhD	Rice University, Houston TX	Statistics	2005

Education: (List all degrees beginning with most recent-include post docs and external certificates)
Ph.D., Statistics, Rice University -- Houston, 2005

M.S., Applied Mathematics, University of Missouri - Rolla, 1995

B.S., Electrical Engineering, St. Mary's University - San Antonio, 1994

Teaching 2003-Present:
Courses Taught
Math 113, College Algebra

Math 146 Calculus for Biological Sciences

Math 394, Mathematics Colloquium

Math 494, Senior Seminar II (numerous topics)

STAT 200, Probability and Statistics

STAT 215, Probability and Statistics for the Social Sciences

STAT 305 Statistics and Quality Control for Engineers

STAT 311, Statistical Methods

STAT 313, Sampling Techniques

STAT 350, Mathematical Statistics I

STAT 351, Mathematical Statistics II

STAT 495, Independent Study (Actuarial Statistics)

STAT 396, Topics (Biostatisitcs)

STAT 412, Correlation and Regression

STAT 425, Design and Analysis of Experiments

Evidence of Continuous Improvement

Attend Professional Development Seminars at CMU/Mesa State - approximately 2 per year

Innovative Materials/Activities

Created STAT 215, Probability and Statistics for the Social Sciences

Created STAT 305, Statisticias and Quality Control for Engineering

Implemented STAT 351 into Statistics program

Implemented MATH 484 & 494, Senior Seminar I and II into Statistics Program

Supervision of Student Research/Project(s)

Town of Montrose Public Survey, current (Tyler Nelson, Mackenzie Schmalz)

Town of Palisade Public Survey, 2011 (Alex Hafer)

Extreme Value Theory with an Application to Air Quality (Mesa County Health Department), 2010 (Shane Chatfield)

Johnson Space Center Chi-Squared Analysis, 2010 (David Miller, Shane Chatfield, Mackenzie Schmalz)

Extreme Value Theory, 2009 (Mike Burkes)

The Random Voting Model, 2009 (Courtney Gibbon)

The Effect of Wealth on Childhood Academic Achievement: The Inheritance of Success, 2009 (Katherine Pearson)

Gambler's Ruin, 2009 (Mallory Reid)

Logistic Regression Applied to Football, 2009 (Will Zimmerer)

Point Estimation and West Nile (Mesa County Health Department), 2009 (Cerise Moran)

Scholarship and Creative Work, 2003-Present:
PhD Thesis, Rice University "On the Operating Characteristics of Some Non-parametric Methodologies for the Classification of Distributions by Tail Behavior"

Creative Work Related to Discipline

Colloquium Talks
Calculus III in 3D, Sept. 30 2011

A Moment in Time, Nov. 19, 2010

Bootstrapping Various Statistics, Sept. 25 2009

Origin of Statistics, March 27 2009

Behavior of the maximum, The Extremal Types Theorem, April 3 2009

Conference Talks
Air Pollution in the grand Valley - 4 Corners Conference, 2010

Science, Biology, Algebra and Statistics Middle School Classroom Applications and Technology - MSP Regional Conference

March 2011

Other:

Grants
Mesa State Middle School Math & Science Partnership, "No Child Left Behind" US Department of Education Grant issued through Colorado Department of Education, 2007 - 2011

Wrote MSP Grant with District 51 - program funded 2013-2015

Publishings: "Lower levels of harvest traffic on alfalfa have minimal impact on long-term yields" by Novotny, Ott, & Rechel

Unpublished research
"Testing for Tail Behavior Using Extreme Spacings" by Javier Rojo and Rick Ott (submitted to Journal of Multivariate Analysis)

"A Mode Detecting Control Chart"by Rick Ott

"Renal Impairment and Cerebral Dysfunction Following Cardiac Surgery: Is the Embol-X Cannulation System an Effective Treatment?" by Sherrie McCoy, Jim Narrod, Rick Ott, ...

Professional Memberships
ASA
Service 2003-Present:
University
Academic Policies Committee, Chair 2010-2011

Teacher Ed Master Program Facilitator for Capstone, 3 years

Department
On six hiring committees

Community
Local
Lincoln Park Men's Club President
Science/Math Fair Judge Numerous Times
Advising 2003-Present:
University level
Attend numerous advising and recruiting activities

Department level
Advise all Math Stat students

Honors and Awards 2003-Present:
National

Regional

Local

Professional Experience:
Resident Instruction Assistant Professor, Fall 2005 - Spring 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, Rice University Fall 2001-2003
Elementary Applied Statistics

Graduate Assistant Instructor, Rice University Spring 2001-2003
Data, Models, Reality: An Introduction to the Scientific Method

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

Please record the number "items/events" you have listed above in the following categories.
If you specify items/events under "other," please provide an explanation/definition.

0	**Books**	0	**Book Reviews**	0	**Creative Publications**
1	**Journal Articles**	0	**Performances**	0	**Patents**
3	**Conference Presentations**	0	**Exhibitions**	2	**Grants-funded and non-funded**
0	**Sabbaticals**	0	**Fullbright**	0	**Book Chapter**
13	**Other (related to discipline)**	MS3 reports and proposal and conference/colloquium talks			

Name:

Erik S Packard

Start Year: 1995

Program:
Mathematics

Department:
Computer Sciences, Mathematics, and Statistics

COLORADO MESA UNIVERSITY

Full-time Faculty Vita

Faculty Rank

○ Professor ○ Assistant Professor

◉ Associate Professor ○ Instructor

Highest Degree

PhD	Texas Tech University	Mathematics	1995

Education: (List all degrees beginning with most recent-include post docs and external certificates)

PhD, Texas Tech University, Mathematics, 1995

MS, Texas Tech University, Mathematics, 1990

BS, Texas Tech University, Mathematics, 1988

Teaching 2003-Present:

Courses Taught :

MATH 113, College Algebra;
MATH 119, Precalculus
MATH 151, Calculus I;
MATH 152, Calculus II;
MATH 310, Number Theory 310;
MATH 369, Discrete Mathematics;
STAT 200, Probability and Statistics;
STAT 313, Sampling Techniques

Innovative Materials/Activities:

For STAT 200, everything for the course has be written by myself and is available online to the students. For Calculus classes, student projects designed to make sure students understand not only how to do, but what and why they are doing have been developed.

Supervision of Student Research/Project(s):

2006-2007 MATH 494, Senior Seminar, 1 student, supervised project on Quadratic Reciprocity

2010-2011 MATH 494, Senior Seminar, 1 student, supervised project on the Statistics of the "Hot Hand" in Basketball

2011-2012 MATH 494, Senior Seminar, 1 student, supervised project on Pseudoprimes.

Scholarship and Creative Work, 2003-Present:

Scholarship Related to Discipline

Other -- Maintain a web page that uses mathematics and a computer program to rank Colorado High School basketball and football teams

Scholarship Related to Pedagogy in Discipline

Book reviews -- 2004 Reviewed Basic Practice of Statistics, by Moore

Professional Memberships -- American Mathematical Society, Mathematics Association of America

Service 2003-Present:
University:
Curriculum Committee 2007-present

Department:
Math Ed Search Committee, 2010

Advising 2003-Present:
University level :

Manned a booth in 2009 for MAVS Scholars Program, Manned a booth in 2010 for Mesa Excitement, Participated in 1-3 SOAR sessions per year.

Department level:
Advised student giving presentation at 2011 Math Extravaganza

Honors and Awards 2003-Present:

Professional Experience:

Please record the number "items/events" you have listed above in the following categories.
If you specify items/events under "other," please provide an explanation/definition.

	Books	1	**Book Reviews**	**Creative Publications**
1	**Journal Articles**		**Performances**	**Patents**
	Conference Presentations		**Exhibitions**	**Grants-funded and non-funded**
	Sabbaticals		**Fullbright**	**Book Chapter**
1	**Other (related to discipline)**	Maintain a web page that uses mathematics and a computer program to rank Colorado High S		

Name:

Lori K. Payne

Start Year: 1986

Program:
Computer Science

Department:
Computer Sciences, Mathematics, and Statistics

COLORADO MESA UNIVERSITY

Full-time Faculty Vita

Faculty Rank

(•) Professor ( ) Assistant Professor

( ) Associate Professor ( ) Instructor

Highest Degree

PhD	University of Northern Colorado	Education Technology - Interactive Technologies	1996

Education: (List all degrees beginning with most recent-include post docs and external certificates)
Ph.D., Educational Technology - Interactive Technologies, University of Northern Colorado,1996.
AWU Faculty Fellowship, 1991.
M.S., Groundwater Hydrology, New Mexico Institute of Mining & Technology, 1984.
B.A., Mathematics & Computer Science, Mesa College, 1978.
A.S., Mathematics, Mesa College, 1976.

Teaching 2003-Present:
Courses Taught
CSCI 111 CS1: Foundations of Computer Science

CSCI 112 CS2: Data Structures

CSCI 250 CS3: Intro. To Algorithms

CSCI 330 Programming Languages

CSCI 337 User Interface Design

CSCI 396 Independent Study

CSCI 460 Database Design

CSCI 480 Theory of Algorithms

MATH 113 College Algebra

Math 110 College Mathematics

MATH 361 Numerical Analysis

STAT 200 Probability & Statistics

Stat 214 Business Statistics

Evidence of Continuous Improvement

Dr. Paul Gaston - Jan. 10-11, 2013, General Education Workshop

John Nicoletti - Campus Safety Workshop - March 14, 2012

Ken Bain Workshop - What the Best Teachers Do - August 8-9, 2012

Learning and Study Strategies Inventory (LASSI) Implementation by Sonia Brandon, CMU, Oct. 18, 2011

Dr. Patty Phelps Workshop on Course Redesign and Revitilization, Jan 16, 2010

Dr. Ed Neal Workshops on Critical Thinking & Classroom Management, May 1-2, 2008

"Redesign of College Algebra"- Conference at Louisiana State University, April 17-18, 2008

Dr. Diane Nyhammer Workshops on Assessment and Program Reviews, January, 2008

Dr. Linda Nielson Workshop on "Reaching the 75% of Students Who Don't Do The Reading" on May 3-4, 2007

"Shifting Landscapes: Assessment, Rentention and Learning" - Conference in Albuquerque Feb 22-23, 2007

Innovative Materials/Activities

2007
--Adopted use of MyStatLab in Stat 200 as part of project to improve student success in statistics

2003
--Adapted spreadsheet use for all projects in Math 361 Numerical Analysis

Supervision of Student Research/Project(s)
April 26, 2013 - CSCI 337 - 25 students in 7 student groups presented at Student Showcase, CMU
April 27, 2011: 20 Students in 6 groups presented at Student Symposium, CMU
Spring, 2011 - CSCI 337 - 23 Students in 7 groups developed software projects
Spring, 2009 - CSCI 337 - 17 Students in 7 groups developed software projects
Spring, 2007 - CSCI 337 - 6 students in 2 groups developed software projects
Spring, 2006 - CSCI 337 - 9 students in 4 groups developed software projects
Spring 2004 - CSCI 337 - 4 students in 2 groups developed software projects
Spring 2003 - CSCI 337 - 12 students developed software projects

Scholarship and Creative Work, 2003-Present:

Scholarship Related to Discipline

Other
Adapted to new software/versions of software as needed for teaching purposes but IS scholarship in Computer Science.
2011
--VS 2010 update
--Access 2010
2011
--Delphi XE
2009
--VB.NET
--Access 2007
2008
--Silverlight Fortran 95
2007
--Turbo Delphi
2006
--Delphi Studio 2006

2004
--Delphi.NET

Service 2003-Present:
University
2011
-- Department Head, CSMS
--Academic Council
--APQPP Committee & APQPP Green Subcommittee
--WGISAS - Working Group On Improved Student Academic Success
2010
-- Department Head, CSMS
--Academic Council
--APQPP Committee & APQPP Green Subcommittee
--Interdisciplinary Committee
2009
-- Department Head, CSMS
--Academic Council
-- Developmental Advisory Committee
--APQPP Committee
--Meetings with Engineers/Contractors/Architects on remodel of Wubben Science Building
2008
-- Department Head, CSMS
--Academic Council
-- Developmental Advisory Committee
--Web Content Committee
--Voluntary Accountability Committee
--Meeting with Architects on remodel of Wubben Science Building
--APQPP Committee
2007
-- Department Head, CSMS - starting Summer, 2007
--Academic Council
--Web Content Committee
--Main Elementary Education/PBS Coursework Committee
2006
--Coordinator of Computer Science
--MAA Conference Committee (MSC hosted the bi-regional conference)
2005
--Coordinator of Computer Science
2004
--Technology Committee - Chair (until Oct, 2004)
--Technology Survey - recalculated statistics and generated report
2003
--Coordinator of Computer Science
--Technology Committee - Chair

Department
2009
--Computer Science Program Review (Chair)
--Online Course Recommendations Committee
2008
--Search for Administrative Assistant
2007
--Coordinator of Computer Science (Continued as Dept Head of CSMS)
--Search for Administrative Assistant
2006
--Coordinator of Computer Science

--MAA Conference Planning Committee (MSC hosted the bi-regional conference)
2005
--Coordinator of Computer Science
--MAA Conference Planning Committee (MSC hosted the bi-regional conference) - Fall only
2004
--Coordinator of Computer Science
--Faculty Evaluation Criteria Committee
--Computer Science Program Review Committee (Chair)
2003
--Questionnaire developed,delivered on CS111 Students
--Host of Meeting with Dist 51 on Computer Science

Community
2007
-- Speech Judge at Palisade High Debate Tournament
-- Speech Judge at Central High Debate Tournament
2006
-- Speech Judge at Palisade High Debate Tournament
-- Speech Judge at Central High Debate Tournament
2005
-- Speech Judge at Palisade High Debate Tournament
-- Speech Judge at Central High Debate Tournament
2004
-- Speech Judge at Palisade High Debate Tournament
-- Speech Judge at Central High Debate Tournament
-- Speech Judge at Grand Junction High Debate Tournament
2003
-- Speech Judge at Palisade High Debate Tournament
-- Speech Judge at Central High Debate Tournament

Advising 2003-Present:

University level
2011
--SOAR sessions: 3
--Mesa Experience: 2
2010
--SOAR sessions: 4
--Mesa Experience: 2
2009
--SOAR sessions: 2
--Mesa Experience: 1
--Mesa Scholar's: 2
2008
--SOAR sessions: 4
--Mesa Madness: 1
2007
--SOAR sessions: 6
--Attended Mesa Scholar's Night
2006
--SOAR sessions: 4
2005
--SOAR sessions: 2

Department level
2003-2011

Student Advisor - 15-40 students

Honors and Awards 2003-Present:

Professional Experience:

1984-1991 - Software Engineering Consultant (self-employed). Created software solutions for local companies, including 5 years at Meadow Gold Dairies.

1981-1983. Research/Teaching Assistant at New Mexico Tech. Wrote modelling programs testing numerical analysis techniques, debugged canned programs for departments such as geophysics, geology and hydrology, served as resource for students/researchers on computer projects.

1977-1981 Computer Programmer/Operator. St. Mary's Hospital. Developed software, trained personnel to use software, operated and managed the computer/printers/monitors in the Data Processing department.

Please record the number "items/events" you have listed above in the following categories.
If you specify items/events under "other," please provide an explanation/definition.

Books	**Book Reviews**	**Creative Publications**
Journal Articles	**Performances**	**Patents**
Conference Presentations	**Exhibitions**	**Grants-funded and non-funded**
Sabbaticals	**Fullbright**	**Book Chapter**
Other (related to discipline)		

Joy Potter

1453 Rood Avenue, Grand Junction, CO 81501
(970) 243-7593 Home • (970) 261-1288 Cell
joypotter@bresnan.net

Professional Experience

January 1996 - present | Grand Junction High School | Grand Junction, CO

Mathematics and Social Studies Teacher

- Taught subjects including Algebra I through Pre-Calculus, Business Math, Consumer Math, Global Studies, Sociology, World History; responsible for all duties associated with position including:
  - ✓ Curriculum design, development, and implementation
  - ✓ Classroom management
  - ✓ Parent Communication – design and implementation of website, conferences
  - ✓ Working in Professional Learning Communities to develop common assessments, developing Individualized Learning Plans (with counselors, administration, and parents)
  - ✓ Standardized test administration – ACT, ITBS, CSAP/TCAP, NWEA Mapps
  - ✓ Student Academic Advising and Scheduling
- Other Professional Responsibilities
  - ✓ Teacher of Dance and development of curriculum (for Accreditation)
  - ✓ MESA Sponsor
  - ✓ Member of District Performance Based Diploma committee
  - ✓ Supervise student teachers and interns
  - ✓ Color Guard Instructor
  - ✓ Choreography of school musical and assist Drama Department
  - ✓ Supervise extracurricular and evening activities

June 2007 - present | Creative Avenues, LLC | Grand Junction, CO

Owner and Director

- Established arts and education center for the children and adults – offer programs in visual arts, performing arts, activity/fitness and academic enrichment
- Owner responsibilities:
  - ✓ Scheduling of programs and staff
  - ✓ Bookkeeping including A/R and A/P , payroll, bank reconciliation (using QuickBooks and/or Microsoft Excel)
  - ✓ Analyze financial data for long-term budgeting and planning
  - ✓ Employee management and conflict resolution
  - ✓ Communication with the public (customers, local organizations, radio, television, newspaper, school district, Fun Fairs etc.)
  - ✓ Coordinate and develop curriculum
  - ✓ Graphic design for webpage and advertising
- Teacher of classes in performing arts and producer/assistant director for Youth Theater Project

August 2007 – June 2008 | Surface Creek Vision School | Cedaredge, CO

Resource Consultant, Highly Qualified (mathematics)

- Review individual learning plans
- Provide tutoring and academic advising
- Coordinate with students' learning plan coordinator

August 2003 – 2005 (intermittent) Rosemary Beckwith and Associates Grand Junction, CO

Office Assistant

- Accounting tasks using QuickBooks and Microsoft Excel
- Review of financial audits
- Assist in tax preparation

January 1992 – December 1995 Performing Arts Conservatory Grand Junction, CO

Co-owner and Teacher

- Accounting and Bookkeeping (including non-profit financial reporting)
- Assistant director, construction technician
- Customer relations – ticket sales, educational outreach programs
- Teacher of dance and music theater and performer in community theater program

May 1993 – June 1995 Carmike Cinemas Grand Junction, CO

Assistant Manager

- Scheduling of employees (staff of approximately 30 employees)
- Management of employee shifts
- Customer relations and problem-solving

Other Associations and Leadership Positions

- June 2009 – July 2011 Beyond Boundaries Artistic Board of Directors Member
- May 2010 – Dec. 2011 Grand Junction Commission on Arts and Culture Board Member

Education and Licensing

May 1995 Mesa State College Grand Junction, CO

Bachelor of Science, Mathematics

- Minor in Dance and Emphasis in Education

May 2005 Metropolitan State College Denver, CO

Bachelor of Science, Accounting

Colorado Department of Education Professional Teacher License

License #91407
Endorsement: Secondary Mathematics
Effective: December 15, 2013
Expires: December 15, 2018

References

Joan Cameron (970) 245-8601 2278 El Verano Court Grand Junction, CO 81503 jcameron@bresnan.net	Genice Matzke (719) 388-8858 5129 Oyster Bay Drive Colorado Springs, CO 80920 genice.matzke@asd20.org	Robert Lubinski (970) 241-1790 2709 N. 8th Court Grand Junction, CO 81506 bolubi@bresnan.net

Name:

Reitenbach Markus

Start Year: 2006

Program:
Mathematics

Department:
Computer Sciences, Mathematics, and Statistics

COLORADO MESA UNIVERSITY

Full-time Faculty Vita

Faculty Rank

○ Professor ○ Assistant Professor

◉ Associate Professor ○ Instructor

Highest Degree

PhD	Syracuse University	Mathematics	2005

Education: (List all degrees beginning with most recent-include post docs and external certificates)

Teaching Postdoctoral Fellow, Mathematics, Syracuse University, 2005-2006

Ph.D., Mathematics, Syracuse University, 2005

Diploma, University of Ulm, 2000

Teaching 2003-Present:

Courses Taught

MATH 110, College Mathematics
MATH 113, College Algebra
MATH 119, Precalculus
MATH 135, Engineering Calculus I
MATH 146, Calculus for Biological Sciences
MATH 151, Calculus I
MATH 152, Calculus II
MATH 236, Differential Equations
MATH 240, Introduction to Advanced Mathematics
MATH 253, Calculus III
MATH 260, Differential Equations and Linear Algebra
MATH 310, Number Theory
MATH 325, Linear Algebra
MATH 394, Mathematics Colloquium
MATH 396, Topics: Cryptology
MATH 420, Introduction to Topology
MATH 452, Introduction to Real Analysis I
MATH 453, Introduction to Real Analysis II
MATH 484, Senior Seminar I
MATH 494, Senior Seminar II
MATH 491, Abstract Algebra I
MATH 491, Abstract Algebra II
STAT 200, Probability and Statistics

Evidence of Continuous Improvement

Student Learning Workshop (Ken Bain), CMU, Aug 2012
Assessment Workshop (Jessica Herrick), Mesa State College, Jan 2011
Teaching Workshop (Patricia Phelps), Mesa State College, Jan 2010
Legacy of R.L. Moore Conference (about inquiry based learning), Austin, TX, June 2009
Teaching Workshop (Diane Nyhammer), Mesa State College, Jan 2008

MathFest, San Jose, CA, Aug 2007
MAA Meeting, Pueblo, CO, Apr 2007
Joint Mathematical Meetings, New Orleans, LA, Jan 2007
MathFest, Knoxville, TN, Aug 2006

Supervision of Student Research/Project(s)
MATH 494, Senior Seminar: Unifying the discrete and continuous definitions of expected value through measure theory (Tyler Nelson), Spring 2013
MATH 494, Senior Seminar: Using fractional calculus to model visco-elasticity (Chris Payne), Spring 2012
MATH 494, Senior Seminar: Sperner's Lemma, fixed points and equilibria (Caitlin Anderegg), Spring 2012
MATH 494, Senior Seminar: An algebraic construction of the p-adic numbers (Joshua Garland), Spring 2008
MATH 494, Senior Seminar: Constructions of space-filling curves (Robert Miller), Spring 2007

Scholarship and Creative Work, 2003-Present:
Scholarship Related to Teaching
Book Chapters
"Teaching Proof-Writing by Public Grading" in "Innovative Techniques for Teaching Proof-Writing", to be published by the Mathematical Association of America

Scholarship Related to Discipline
Journal Articles
"Adjoint Functors, Projectivization, and Differentiation Algorithms for Representations of Partially Ordered Sets" (with M. Kleiner), Journal of Algebra 353 (2012), pp. 224-248
"A Generalization of the Identity cos(pi/3)=1/2" (with E. Packard), Mathematics Magazine 85 (2012), pp. 124-125

Conference Presentations
"Versions of the Axiom of Choice," MAA Meeting, Pueblo, CO, Apr 2007

Professional Memberships
Mathematical Association of America

Service 2003-Present:
University
Pre-Tenure Review Committee, since 2013
Tutorial Services Advisory Committee, since 2008
Assessment Committee, 2007-2014
Assistant Coordinator of Tutorial Services Hiring Committee, Fall 2006

Department
Statistics Instructor Hiring Committee, Spring 2012
Mathematics Tenure-Track Hiring Committee, Spring 2011
Mathematics Tenure-Track Hiring Committee, Spring 2010
Program Review Committee, 2009
Various Book Search Committees, since 2006
Travel Committee, 2007
Math Extravaganza, since 2006

Advising 2003-Present:
University level
Participated in Student Orientation and/or Mesa Experience at least 3 times every year

Department level
Usually have around 8 advisees

Honors and Awards 2003-Present:
National

Professional Experience:

Please record the number "items/events" you have listed above in the following categories.
If you specify items/events under "other," please provide an explanation/definition.

0	**Books**	0	**Book Reviews**	0	**Creative Publications**
2	**Journal Articles**	0	**Performances**	0	**Patents**
1	**Conference Presentations**	0	**Exhibitions**	0	**Grants-funded and non-funded**
0	**Sabbaticals**	0	**Fullbright**	1	**Book Chapter**
0	**Other (related to discipline)**				

Name:

Shawn A Robinson

Start Year: 2011

Program:
Mathematics

Department:
Computer Sciences, Mathematics, and Statistics

COLORADO MESA UNIVERSITY

Full-time Faculty Vita

Faculty Rank

○ Professor ◉ Assistant Professor

○ Associate Professor ○ Instructor

Highest Degree

PhD	University of North Carolina at Chapel Hill	Mathematics	2001

Education: (List all degrees beginning with most recent-include post docs and external certificates)

PhD	University of North Carolina at Chapel Hill	Mathematics	2001
MS	Emory University	Mathematics	1994
BS	Emory University	Mathematics	1994

Teaching 2003-Present:

Courses Taught

MATH 110, College Mathematics
MATH 113, College Algebra
MATH 119, Precalculus
MATH 135, Engineering Calculus I
MATH 136, Engineering Calculus II
MATH 151, Calculus I
MATH 152, Calculus II
MATH 236, Differential Equations and Linear Algebra
MATH 253, Calculus III
MATH 325, Linear Algebra I
MATH 460, Linear Algebra II
MATH 496, Topics -- Introductory Algebraic Geometry

Evidence of Continuous Improvement

Math Circle Teacher Training Workshop, South Bend, IN, July, 2013, supported by CMU Faculty Development Grant

Lumina Degree Profile Workshop, CMU, January, 2012

Sage Mathematics Software Workshop, Clay Mathematics Institute, Cambridge, MA, December, 2009

Professional Development Planning Program, IAS Park City Mathematics Institute, July, 2008

MAA PREP Workshop on Interactive Calculus, May, 2008

Innovative Materials/Activities

Regular use of i-clicker slides for concepts review in Calculus I.

Regular inclusion of collaborative writing projects in Calculus I and II, Differential Equations, and Linear Algebra I.

Supervision of Student Research/Project(s)

CMU Mathematics Senior Research Projects:

"Unitary Space-Time Codes," Christina Reed, Spring, 2012

"Representation Theory," Alyssa Mitchell, Spring, 2013

NSF Research Experience for Undergraduates, Rutgers University, two students, Summer, 2003

Scholarship and Creative Work, 2003-Present:

Scholarship Related to Discipline

Books

Algebraic Geometry: A Problem Solving Approach. With Thomas Garrity et al. American Mathematical Society, Student Mathematical Library, **66**. Print.

Journal Articles

"Grothendieck polynomials via permutation patterns and chains in the Bruhat order." With C. Lenart and F. Sottile. *American Journal of Mathematics.* **128** (2006): 805- 848.

Presentations

"An IBL approach to algebraic geometry." Rocky Mountain Section meeting of the MAA, April 2013.

"An algebro-geometric construction of unitary space-time constellations." Rocky Mountain Section meeting of the MAA, April 2013.

Service 2003-Present:

University

Assessment Committee, vice-chair, 2014-present
Faculty Success Committee, member, 2013-present
Testing Services Search Committee, member, 2013
Distance Teaching and Learning subcommittee member, 2011-2012

Department

Program Review Committee, member, 2014-present
Student Learning Outcomes Assessment Committee, chair, 2012-present
Statistics Search Committee, member, 2013
Mathematics Instructor Search Committee, member, 2012
Mathematics Placement Committee, member, 2011-2012

Community

Central Aroostook (Maine) Math and Science Partnership. Participated in a professional development organization that included secondary and university mathematics teachers and technical professionals. August 2008-May 2010.

Imagine Math Day, University of Maine at Presque Isle. Organized a day of exploring mathematics for local high school students and mathematics teachers. February, 2010, and November, 2008.

Advising 2003-Present:

Faculty Sponsor for Putnam Mathematics Competition, 2013

Mathematics Representative for CMU Majors Fair, fall 2012

SOAR advisor, summer 2012

Academic advisor for three mathematics majors

Honors and Awards 2003-Present:

Professional Experience:

Please record the number "items/events" you have listed above in the following categories.
If you specify items/events under "other," please provide an explanation/definition.

1	**Books**	**Book Reviews**	**Creative Publications**
1	**Journal Articles**	**Performances**	**Patents**
2	**Conference Presentations**	**Exhibitions**	**Grants-funded and non-funded**
	Sabbaticals	**Fullbright**	**Book Chapter**
	Other (related to discipline)		

Name:

Clarence E. Ross

Start Year: 1996

Program:
Mathematics

Department:
Computer Sciences, Mathematics, and Statistics

COLORADO MESA UNIVERSITY

Lecturer Vita

Highest Degree

MS	University of Northern Colorado	Physical Education	1973

Education: (List all degrees beginning with most recent-include post docs and external certificates)

1973 - MS. University of Northern Colorado Physical Eduction

1972 - BS University of Northern Colorado Mathematics and Physical Education

Teaching 2003-Present:
Courses Taught Calculus, College Algebra, College Mathematics, Teaching Physical Education in Secondary Schools

Evidence of Continuous Improvement

Innovative Materials/Activities

Prior Professional Experience Relevant to Current Position: (Include year(s) of employment, employer, position title and responsibilities)

Year(s) of Employment	Employer	Position Title	Position Responsibilities
1996 -2005	MSC	Athletic Director, Asst AD	All Athletics
1976 - 1996	School District 51	Teacher AD Coach	Math Department Head, Advanced

Please record the number "items/events" you have listed above in the following categories.
If you specify items/events under "other," please provide an explanation/definition.

0	**Books**	0	**Book Reviews**	0	**Creative Publications**
0	**Journal Articles**	0	**Performances**	0	**Patents**
0	**Conference Presentations**	0	**Exhibitions**	0	**Grants-funded and non-funded**
0	**Sabbaticals**	0	**Fulbrights**	0	**Book Chapters**
0	**Other (related to discipline)**				

Name:

Molly C Ryan

Start Year: 2013

Program:
Mathematics

Department:
Computer Sciences, Mathematics, and Statistics

COLORADO MESA UNIVERSITY

Full-time Faculty Vita

Faculty Rank

○ Professor ○ Assistant Professor

○ Associate Professor ◉ Instructor

Highest Degree

MA	Adams State College	Counseling	2009

Education: (List all degrees beginning with most recent-include post docs and external certificates)

MA School Counseling, Adams State College, 2009

BS Mathematics, Secondary Education, University of Northern Colorado, 2005

Teaching 2003-Present:

Math 113

Math 110

Workshop-Dr Terry Rhodes 2014

Math 113 development of unique courses to help with retention and success in future math classes.

Scholarship and Creative Work, 2003-Present:

Service 2003-Present:

Advising 2003-Present:

Honors and Awards 2003-Present:

Professional Experience:

Please record the number "items/events" you have listed above in the following categories.
If you specify items/events under "other," please provide an explanation/definition.

Books	**Book Reviews**	**Creative Publications**
Journal Articles	**Performances**	**Patents**
Conference Presentations	**Exhibitions**	**Grants-funded and non-funded**
Sabbaticals	**Fullbright**	**Book Chapter**
Other (related to discipline)		

Name:

Daniel D. Schultz-Ela

Start Year: 2005

Program:
Mathematics

Department:
Computer Sciences, Mathematics, and Statistics

COLORADO MESA UNIVERSITY

Full-time Faculty Vita

Faculty Rank

○ Professor ○ Assistant Professor

◉ Associate Professor ○ Instructor

Highest Degree

PhD	University of Minnesota--Twin Cities	Geology	1988

Education: (List all degrees beginning with most recent-include post docs and external certificates)
M.A., Mathematics Education, Western Governors University, 2010.
Secondary Teaching Certificate, Science and Mathematics, Western State College -- Gunnison, CO, 2005
Ph.D., Geology, Univ. of Minnesota -- Twin Cities, 1988
Sc.M., Geological Sciences, Brown Univ., 1982
Masters-level research, Univ. of Otago -- Dunedin, New Zealand, 1978-1980
B.A., Geology, Carleton College -- Northfield, MN, 1978

Teaching 2003-Present:

Courses Taught

CSCI 305, Technology for Mathematics Educators
EDUC 497C, Methods of Teaching Secondary Mathematics
MATH 090, Introductory Algebra
MATH 091, Intermediate Algebra
MATH 105, Elements of Mathematics I
MATH 110, College Mathematics
MATH 113, College Algebra, traditional and modeling approaches
MATH 121, Business Calculus
MATH 205, Elements of Mathematics II
MATH 301, Mathematics for Elementary Teachers
MATH 305, Euclidean Geometry
MATH 389, Explorations in Mathematics for Elementary Teachers
MATH 394, Mathematics Colloquium
STAT 200, Probability and Statistics

Evidence of Continuous Improvement

Dr. Terrel Rhodes workshop on VALUE Rubrics and ePortfolios Partnership for Learning Presentation, January 16,-17 2014.

Mathematical Sciences Research Institute workshop "Critical Issues in Mathematics Education 2013: Assessment of Mathematical Proficiencies in the Age of the Common Core." University of California, Berkeley, May 2013

Dr. Paul Gaston Faculty Professional Development Workshops on General Education, January 10-11, 2013.

Dr. Ken Bain Faculty Professional Development Workshop on Talking about Teaching: What the Best College Teachers Do, August 9-10, 2012.

Dr. Paul Gaston Faculty Professional Development Workshops on Academically ADROIT: Improving Student Achievement Through Greater Intentionality *and* Lumina Foundation's Degree Qualifications Profile, January 5 - 6, 2012.

Mathematical Sciences Research Institute workshop "Critical Issues in Mathematics Education 2011: Mathematical

Education of Teachers." University of California, Berkeley, May 2011.

Mathematical Sciences Research Institute workshop "Critical Issues in Mathematics Education: Reasoning and Sense-Making in the Math Curriculum." University of California, Berkeley, June 2010.

Mathematical Sciences Research Institute workshop "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, 2008.

Mathematical Association of America PREP workshop "Revitalizing College Algebra." University of Arizona, Tucson, 2007.

Colorado State University, Pueblo, mini-conference "Mathematics for Prospective Elementary Teachers." September 2006.

Innovative Materials/Activities

MATH 110 (College Mathematics): Flipped classroom with clickers for individual and collaborative problem solving

Creation of technology course (CSCI 305) for elementary education mathematics concentrators that accomplishes objectives of algorithmic thinking and programming experience with use of spreadsheet training that is directly relevant to their career path.

Supervision of Student Research/Project(s)

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.

Scholarship and Creative Work, 2003-Present:

Scholarship Related to Discipline

Journal Articles

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.

Conference Presentations

Presentations at Colorado Mesa University Mathematics Colloquia:

Geometry of Equations: Straight Lines Define Curves, Curves Define Cusps. March, 2014.

Algebra for Teaching vs. the Algebra We Teach. November 2012.

The Meaning of Times? - Repeated Addition, Implications for Teaching, and Fraction Division. March 2011.

Numerical Modeling of Geological Structures in Canyonlands National Park. April 2012 and March 2006.

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.

Hudec, M. R., Jackson, M. P. A., and Schultz-Ela, D. D., 2006, Mechanics of the advance of buried salt sheets and implications for predicting subsalt pore pressures (abs.): American Association of Petroleum Geologists Annual Convention, v. 15, p. 50.

Hudec, M. R., Jackson, M. P. A., and Schultz-Ela, D. D., 2005, A compressional origin for minibasins near the Sigsbee Scarp, Gulf of Mexico (abs.): Houston Geological Society Bulletin, December, p. 23 -24.

Hudec, M. R., Jackson, Martin, and Schultz-Ela, D. D., 2005, A compressional origin for minibasins near the Sigsbee Escarpment, Gulf of Mexico (abs.): American Association of Petroleum Geologists Annual Convention abstracts volume, v. 14, p. A64.

How squishy salt formed the landscapes of Arches and Canyonlands National Parks: presented to Hotchkiss K-8 community, May 2005.Schultz-Ela, D. D., 2003, Origin of "drag" folds bordering salt diapers: Am. Assoc. Petroleum Geologists annual meeting, May 2003.

Origin of "drag" folds bordering salt diapers: presented to Geological Society of America annual meeting, May 2003.

Other

Mathematical Explanation Instruction: Western Governor's University, Action research report (101 p. thesis equivalent) and instructional unit, 2010; Dr. A. Izumi, adviser.

Scholarship Related to Pedagogy in Discipline

Conference Presentation

Schultz-Ela, D., 2011. Instruction in mathematical communication through problem-solving explanations. Mathematical Association of America Mathfest 2011, Abstracts of Papers, p. 29-30.

Professional Memberships

National Council of Teachers of Mathematics

Mathematical Association of America

Colorado Council of Teachers of Mathematics

Kappa Mu Epsilon.

Service 2003-Present:

University

2013:

Faculty Senate, including serving as Secretary on the Executive Committee.

Member of the campus-wide committee reviewing content and structure of the General Education requirements at

CMU. Chair subcommittee investigating possible implementation of ePortfolios at CMU.

Member of the university EAS Advisory Committee.

Member of the Faculty Handbook Revision Review committee that evaluated the second half of the handbook and forwarded recommended revisions to the Faculty Senate and Handbook Committee.

Member of the campus-wide Tenure and Promotion committee.

Affirmative Action representative for several searches for tenure-track positions in CSCI.

2012:

Faculty Senate representative.

Member of the university EAS Advisory Committee.

Member of the Faculty Handbook Revision Review committee.

Member of the campus-wide Tenure and Promotion committee.

Affirmative Action representative for two successful searches for tenure-track positions in Psychology and in MGMT in the Business Department.

2011:

Member of the university EAS Advisory Committee.

Affirmative Action representative for two searches for Psychology, at the beginning and end (ongoing) of 2011.

Revised sections of the Education Department's NCATE/NCTM SPA report for accreditation of the secondary mathematics education program.

2010:

Member of the college EAS Advisory Committee.

Training for, and action as, an Affirmative Action representative for a search for a Psychology Program instructor.

2009:

Head of program review for the math concentration in Elementary Education. Contributed substantial portions of the department's program review document and served on that committee.

Member of the college EAS Advisory Committee.

2008:

Head of program review for the math concentration in Elementary Education.

Member of the college EAS Advisory Committee.

Member of the committee to revise the forms for student evaluations of professors.

Member of the committee evaluating applications for the Teach for Colorado grant program.

Member of the Judicial Board for the college (relatively inactive).

Department

Chair of search committees for Mathematics Education instructor (twice) and Mathematics instructor.
Member of search committee for Mathematics tenure-track position.
Sole supervisor for six Mathematics senior seminar projects and co-advisor on one more.
Head of program review for the math concentration in Elementary Education. Contributed substantial portions of the department's program review document and served twice on that committee.

Judge for all of the Senior Seminar final presentations.
Reader for Senior Seminar reports (multiple years).
Chair of textbook committees for College Algebra, College Mathematics, and elementary-education mathematics content-sequence textbook. Member of four other textbook committees.
Assisted and advised revisions of programs for the Mathematics major, the Mathematics major with concentration in Secondary Education, the Mathematics minor, and the Elementary Education major with concentration in Mathematics.
Proposed, developed and taught two new courses in Mathematics and Computer Science to replace less relevant elementary courses for Elementary Education mathematics concentrators.
Member committee to define and systematize student learning objectives.
Member committee to select the outstanding mathematics graduate award.
Assisted in creation of an Abstract Algebra course specifically designed for Secondary Education concentrators.
Coordinator for College Algebra: helped new instructors design an appropriate course, assisted with the MyMathLab online homework system, liaised with the Early Scholars teachers.
Contacted and visited local high schools with CMU math majors to publicize and promote Math Extravaganza.
Manned the information table for the Exploring a Major fair.
Member of outstanding mathematics graduate award committee.

Community
Judge (four times) for the regional Science Fair for secondary students.
Participated in the District 51 initiative to vertically align high school curriculum throughout the district (VAT) --a particularly worthwhile effort to move local secondary teaching from the typical mile-wide, inch-deep approach to a more focused and cohesive curriculum.
Participated in discussions to align preparatory classes for calculus in District 51 with the expectations of our calculus professors and coordinate with their algebra and calculus courses.
Taught Calculus I course to a home-schooled student in Paonia.
Led geology-centered educational hiking trips (four years, four locations) to Utah national parks for a North Fork outing group whose purpose is to build confidence and knowledge for women in the outdoors.
One of three trustees of the Goodwin Foundation, a $3.3 million philanthropic fund that supports CMU scholarships, the McConnell Math and Science Center and many other non-profit causes.

National
Peer reviewer for two National Science Foundation grant proposals and articles in Geological Society of Am. Bulletin and Am. Assoc. of Petroleum Geologists Bulletin.
At the request of the author and publisher, intensively reviewed our Mathematics for Elementary Teachers textbook (Math 105/205/301) to aid revision for a new edition.
Review for W.H. Freeman of suitability of three College Mathematics texts.
Participated in a survey describing our College Algebra content for revision of the ACT test.
Chaired a session at the regional MAA conference held on campus.

Advising 2003-Present:

University level
One Soar session.

Department level
Averaged 70 to 80-plus student advisees for the last six years--essentially all of the Liberal Arts (Elementary Education) majors concentrating in Mathematics and the Mathematics Majors concentrating in Secondary Education. Advised in all aspects of the Mathematics and Education programs, as well as career aspects.

Honors and Awards 2003-Present:

National
George C. Matson Award for best paper at the American Association of Petroleum Geologists annual convention (co-author), 2006.

Local
Exemplary faculty performance rating. Colorado Mesa University, 2009, 2011, 2012.

Professional Experience:

M.A. in Mathematics Education.

Secondary teaching certification from the state of Colorado in mathematics and science.

One year of teaching secondary (8th grade) mathematics, 2004-2005.

15 years as a research scientist (Ph.D. in Geology) at Univ. of Texas--Austin doing numerical modeling and mathematical analysis of geological structures. Includes numerous publications on statistics, numerical methods, analytical and numerical mathematical models of deforming rocks, a commercial software application for geometric retrodeformation, and numerous software applications for research use, 1989-2004.

Please record the number "items/events" you have listed above in the following categories.
If you specify items/events under "other," please provide an explanation/definition.

	Books	**Book Reviews**	**Creative Publications**
6	**Journal Articles**	**Performances**	**Patents**
6	**Conference Presentations**	**Exhibitions**	**Grants-funded and non-funded**
	Sabbaticals	**Fullbright**	**Book Chapter**
14	**Other (related to discipline)**	Research and instructional unit for Master's capstone project; 10 public presentations on app	

Name:

Risharra A Stulc

Start Year: 2009

Program:
Mathematics

Department:
Computer Sciences, Mathematics, and Statistics

COLORADO MESA UNIVERSITY

Full-time Faculty Vita

Faculty Rank

○ Professor ○ Assistant Professor

○ Associate Professor ◉ Instructor

Highest Degree

MA	Grand Canyon University	Special Education	2012

Education: (List all degrees beginning with most recent-include post docs and external certificates)

MA, Special Education, GCU, 2012

Teaching Certificate, Secondary Mathematics, Western State University, 2009

BS, Mathematics- Applied Statistics, University of Northern Colorado, 2006

Teaching 2003-Present:

Courses Taught -

MATC 090, Introductory Algebra
MATC 091, Intermediate Algebra
MATH 096 Topics in Algebra
MATH 113 College Algebra
MATH 119 Precalculus
STAT 200, Probability and Statistics
STAT 215, Statistics for Social and Behavioral Sciences

Evidence of Continuous Improvement

DegreeWorks training by Kathryn McMillan, CMU, September 22, 2014
Understanding and Applying Concepts of Neuroscience to Teaching and Learning in the Higher Education Classroom by Leslie Myers, CMU, August 13, 2014
Cengage Learning EWA Summer Training Institute, Chicago, July 24-25, 2014
Dr. Ken Bain Faculty Professional Development Workshop on Talking about Teaching: What the Best College Teachers Do, August 9-10, 2012.
Campus Safety Awareness Training by Dr. John Nicoletti, CMU, March 14, 2013
Development of lab projects for STAT 215 Statistics for Social Behavioural Science using SPSS software '
Distance Education and D2L training and certification December 2012

Innovative Materials/Activities

SPSS Software
Graphing Calculator
Microsoft Office Suite
Creation of material covered and data collected in Topics for Algebra Review Class (Math 096) that accomplishes objectives for students to continue on in College Algebra

Scholarship and Creative Work, 2003-Present:

Scholarship Related to Pedagogy in Discipline

Conference Presentations
How to be Statistically Smart, February 28, 2014 Mathematics Colloquium, Department of Computer Science, Mathematics and Statistics, Colorado Mesa University

Service 2003-Present:

University

SOAR- July, 20 2014.
Mesa Experience-April 4, 2014

Department

Algebra Review Committee Math 096 2014-present
Early Scholars Committee 2011-present
College Algebra Book Selection Committee 2014
STAT 200/215 Book Selection Committee 2013
Common Final for College Algebra Committee - 2014

Advising 2003-Present:

Honors and Awards 2003-Present:

Local

Exemplary Faculty Award, Colorado Mesa University, May 2014

Professional Experience:

Please record the number "items/events" you have listed above in the following categories.
If you specify items/events under "other," please provide an explanation/definition.

0	**Books**	0	**Book Reviews**	0	**Creative Publications**
0	**Journal Articles**	0	**Performances**	0	**Patents**
1	**Conference Presentations**	0	**Exhibitions**	0	**Grants-funded and non-funded**
0	**Sabbaticals**	0	**Fullbright**	0	**Book Chapter**
0	**Other (related to discipline)**				

Name:

Leatha Tubbs

Start Year: 1995

Program:
Mathematics

Department:
Computer Sciences, Mathematics, and Statistics

COLORADO MESA UNIVERSITY

Lecturer Vita

Highest Degree

MEd	Adams State College	Mathematics Education	1968

Education: (List all degrees beginning with most recent-include post docs and external certificates)

MEd Mathematics Education Adams State College 1968

BS Science Minor in Mathematics Colorado State University 1963

Teaching 2003-Present:
Taught Introductory Algebra, Intermediate Algebra, College Mathematics, Tech Math

Prior Professional Experience Relevant to Current Position: (Include year(s) of employment, employer, position title and responsibilities)

Year(s) of Employment	Employer	Position Title	Position Responsibilities
1965 - 1995 Teacher	School District 51	Mathematics Teacher	High School/ Jr. High Mathematics

Please record the number "items/events" you have listed above in the following categories.
If you specify items/events under "other," please provide an explanation/definition.

Books	**Book Reviews**	**Creative Publications**
Journal Articles	**Performances**	**Patents**
Conference Presentations	**Exhibitions**	**Grants-funded and non-funded**
Sabbaticals	**Fulbrights**	**Book Chapters**
Other (related to discipline)		

Name:

Wayn K Ward

Start Year: 2009

Program:
Mathematics

Department:
Computer Sciences, Mathematics, and Statistics

COLORADO MESA UNIVERSITY

Full-time Faculty Vita

Faculty Rank

○ Professor ○ Assistant Professor

○ Associate Professor ◉ Instructor

Highest Degree

MS	University of Nevada, Las Vegas	Physics	2007

Education: (List all degrees beginning with most recent-include post docs and external certificates)

MS, Physics, University of Nevada, Las Vegas--2007

BS, Physics, Colorado Mesa University--2004

Teaching 2003-Present:

Courses Taught

MATH 091 Intermediate Algebra

MATH 110 College Mathematics

MATH 113 College Algebra

MATH 119 Precalculus

MATH 121 Calculus for Business

MATH 141 Analytical Geometry

MATH 151 Calculus I

MATH 152 Calculus II

PHYS 100 Concepts of Physics

Scholarship and Creative Work, 2003-Present:

Scholarship Related to Discipline

Conference Presentation

"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 2003-Present:

2013

--Search Committee Member - Instructor of Mathematics

Advising 2003-Present:

Honors and Awards 2003-Present:

Local

Colorado Mesa University Exemplary Faculty Award, 2010.

Professional Experience:

Please record the number "items/events" you have listed above in the following categories.
If you specify items/events under "other," please provide an explanation/definition.

	Books	**Book Reviews**	**Creative Publications**
	Journal Articles	**Performances**	**Patents**
2	**Conference Presentations**	**Exhibitions**	**Grants-funded and non-funded**
	Sabbaticals	**Fullbright**	**Book Chapter**
	Other (related to discipline)		

Name:

Zhong Wu

Start Year: 1989

Program:
Mathematics

Department:
Computer Sciences, Mathematics, and Statistics

COLORADO MESA UNIVERSITY

Full-time Faculty Vita

Faculty Rank

(•) Professor ( ) Assistant Professor

( ) Associate Professor ( ) Instructor

Highest Degree

PhD	University of Cambridge	Applied Mathematics and Theoretical Physics	1984

Education: (List all degrees beginning with most recent-include post docs and external certificates)

Ph.D, University of Cambridge (1980-1984)

B.S, China University of Science and Technology (1963-1968)

Teaching 2003-Present:
Courses Taught
Math 360 Methods of Applied Mathematics
Phys 496 Topics (Cosmology)
Math 253 Calculus III
Math 121 Ordinary Differential Equations
Math 121 Calculus for Business
Math 119 Precalculus
Math 113 College Algebra
Math 110 College Mathematics
Phys. 362 Statistical and Thermal Physics
Phys. 311 Electromagnetic Theory I

Scholarship and Creative Work, 2003-Present:
Scholarship Related to Discipline

Books

1. A Briefer History of Time by S.W. Hawking and L. Mlodinow (translation from English to Chinese (2008)

2. The Grand Design by S.W. Hawking and L. Mlodinow (translation from English to Chinese (2011)

3. The Collected Works of Albert Einstein (Volume 6) (translation from English to Chinese) (2008)

Journal Articles

Conference Presentation

On dimensionality, presented in Pescara, Italy, Relativistic Astrophysics conference (2007)

On the cosmological constant, presented in Taipei, Taiwan, Relativistic Astrophysics conference (2008)

Other

Visiting Cambridge University, (2004-2005, 2006, 2009)

Creative Work Related to Discipline

Sabbaticals
I took a sabbatical leave in 2004-2005 (doing research and translating books)

Professional Memberships

Associate Member of International Center for Relativistic Astrophysics, Rome University, Italy (1989-present)

Member of Western Colorado Astronomy Club, Grand Junction, Colorado (1989-present)

Service 2003-Present:
University
2003-2007
Tenure and Promotion Review Committee
2003
Sabbatical Leave Committee
2003-2005
Professional Development Committee

Department
Textbook Selection Committee (Calculus, Precalculus ...)

Community
2003-present
Western Colorado Astronomy Club

National

Regional

Local

Advising 2003-Present:
University level
SAOR

Department level
various
Honors and Awards 2003-Present:
National

Regional

Local

Professional Experience:

Please record the number "items/events" you have listed above in the following categories.
If you specify items/events under "other," please provide an explanation/definition.

3	**Books**	**Book Reviews**	**Creative Publications**
	Journal Articles	**Performances**	**Patents**
2	**Conference Presentations**	**Exhibitions**	**Grants-funded and non-funded**
1	**Sabbaticals**	**Fullbright**	**Book Chapter**
	Other (related to discipline)		

Appendix D

Mathematics Majors and Minors

			Academic Year											
			2008-09		2009-10		2010-11		2011-12		2012-13		2013-14	
Degree	Code	Major	1st*	All	1st	All	1st	All	1st	All	1st	All	1st	All
AS	**2425**	**Liberal Arts, Mathematics**	**11**	**16**	**4**	**7**	**5**	**9**	**6**	**12**	**13**	**20**	**17**	**18**
	2490	**Liberal Arts, Undec NatSc/Math**	**24**	**25**	**15**	**19**	**13**	**17**	**7**	**12**	**8**	**15**	**6**	**11**
PB	**2942**	**Mathematics Provisional Bacc**	**0**	**0**	**20**	**20**	**32**	**33**	**18**	**18**	**24**	**24**	**17**	**17**
	2943	**Statistics Prov Bacc**	**0**	**0**	**29**	**30**	**28**	**29**	**21**	**22**	**18**	**19**	**10**	**11**
BA	**3251**	**Liberal Arts, Elem Teaching, Math**	**13**	**13**	**25**	**30**	**34**	**40**	**45**	**57**	**41**	**54**	**33**	**47**
BS	**3402**	**Mathematics, Pre-Teacher Ed**	**0**	**0**	**38**	**43**	**51**	**58**	**22**	**29**	**19**	**21**	**11**	**11**
	3424	**Mathematics**	**31**	**41**	**0**	**0**	**1**	**1**	**2**	**2**	**1**	**1**	**1**	**1**
	3430	**Mathematics, Secondary Cert**	**45**	**49**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**
	3434	**Mathematics-Statistics**	**9**	**11**	**0**	**0**	**0**	**0**	**12**	**12**	**15**	**16**	**26**	**28**
Total			**133**	**155**	**131**	**149**	**164**	**187**	**134**	**165**	**139**	**170**	**121**	**144**

Tables A and B: Mathematics majors and minors by year and concentration

*Note that 1st referrers to First Major.

		Academic Year				
Minor	Code	2009-10	2010-11	2011-12	2012-13	2013-14
Mathematics	**M460**	**14**	**14**	**17**	**15**	**0**
Statistics	**M465**	**2**	**4**	**4**	**3**	**3**
Total		**16**	**18**	**21**	**18**	**3**

Tables C and D: Degrees and minors awarded by year and concentration.

			Academic Year												
			2008-09		2009-10		2010-11		2011-12		2012-13		2013-14		
Degree	Code	Major	1st	All	1st	All	1st	All	1st	All	1st	All	1st	All	Total All
AS	**2425**	**Liberal Arts, Mathematics**	**1**	**1**	**2**	**2**	**1**	**1**	**1**	**1**	**2**	**2**	**3**	**3**	
BA	**3251**	**Liberal Arts, Elem Teaching, Math**	**4**	**4**	**3**	**3**	**6**	**6**	**5**	**5**	**6**	**6**	**5**	**5**	
BS	**3424**	**Mathematics**	**3**	**4**	**4**	**5**	**3**	**3**	**8**	**8**	**4**	**5**	**4**	**6**	
	3430	**Mathematics, Secondary Cert**	**9**	**9**	**2**	**2**	**9**	**9**	**1**	**1**	**5**	**5**	**5**	**5**	
	3434	**Mathematics-Statistics**	**7**	**7**	**1**	**1**	**0**	**0**	**0**	**0**	**3**	**4**	**5**	**6**	
Total			**24**	**25**	**12**	**13**	**19**	**19**	**15**	**15**	**20**	**22**	**22**	**25**	**119**

		Academic Year				
Minor	Code	2009-10	2010-11	2011-12	2012-13	2013-14
Mathematics	**M460**	**5**	**1**	**8**	**2**	**5**
Statistics	**M465**			**1**	**1**	**1**
Total		**5**	**1**	**9**	**3**	**6**

Table E: Registrations and student credit hours by student level

		Academic Year											
		2008-09		2009-10		2010-11		2011-12		2012-13		2013-14	
Subject	Student Level	Enrolled	SCH	Enrolled	SCH	Enrolled	SCH	Enrolled	SCH	Enrolled	SCH	Enrolled	SCH
MATH	**FR**	**660**	**2560**	**846**	**3275**	**996**	**3888**	**1105**	**4368**	**1097**	**4303**	**1149**	**4516**
	SO	**613**	**2357**	**795**	**3140**	**910**	**3520**	**1005**	**3933**	**1135**	**4493**	**1140**	**4498**
	JR	**297**	**1111**	**358**	**1342**	**447**	**1707**	**443**	**1689**	**529**	**2001**	**526**	**2072**
	SR	**394**	**1390**	**420**	**1483**	**447**	**1581**	**519**	**1864**	**494**	**1767**	**571**	**2069**
	PBL	**11**	**37**	**12**	**38**	**14**	**42**	**12**	**37**	**8**	**25**	**2**	**7**
	Grad	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**3**
	Non-Deg	**74**	**300**	**75**	**303**	**67**	**270**	**26**	**107**	**36**	**149**	**21**	**90**

Table E: Registrations and student credit hours by student level (continued)

Total		**2049**	**7755**	**2506**	**9581**	**2881**	**11008**	**3110**	**11998**	**3299**	**12738**	**3410**	**13255**
STAT	**FR**	**31**	**93**	**38**	**114**	**50**	**150**	**48**	**148**	**39**	**118**	**39**	**119**
	SO	**275**	**825**	**287**	**861**	**334**	**1032**	**336**	**1034**	**363**	**1122**	**444**	**1397**
	JR	**212**	**636**	**222**	**666**	**246**	**765**	**272**	**867**	**285**	**907**	**336**	**1101**
	SR	**208**	**624**	**191**	**572**	**207**	**641**	**221**	**692**	**238**	**765**	**216**	**692**
	PBL	**1**	**3**	**1**	**3**	**1**	**4**	**1**	**3**	**4**	**12**	**3**	**9**
	Grad	**0**	**0**	**1**	**3**	**6**	**18**	**0**	**0**	**0**	**0**	**1**	**3**
	Non-Deg	**3**	**9**	**8**	**24**	**3**	**9**	**4**	**12**	**0**	**0**	**0**	**0**
Total		**730**	**2190**	**748**	**2243**	**847**	**2619**	**882**	**2756**	**929**	**2924**	**1039**	**3321**

Table F: Registrations and Student Credit Hours by Course Level

		Academic Year											
		2008-09		2009-10		2010-11		2011-12		2012-13		2013-14	
Subject	Course Level	Enrolled	SCH	Enrolled	SCH	Enrolled	SCH	Enrolled	SCH	Enrolled	SCH	Enrolled	SCH
MATH	**100**	**1713**	**6685**	**2137**	**8426**	**2428**	**9531**	**2627**	**10464**	**2834**	**11243**	**2931**	**11702**
	200	**133**	**475**	**142**	**498**	**197**	**721**	**208**	**746**	**189**	**705**	**220**	**810**
	300	**151**	**454**	**170**	**502**	**216**	**645**	**192**	**565**	**208**	**613**	**184**	**544**
	400	**52**	**141**	**57**	**155**	**40**	**111**	**83**	**223**	**68**	**177**	**75**	**199**
Total		**2049**	**7755**	**2506**	**9581**	**2881**	**11008**	**3110**	**11998**	**3299**	**12738**	**3410**	**13255**
STAT	**200**	**691**	**2073**	**729**	**2187**	**816**	**2526**	**840**	**2630**	**886**	**2795**	**991**	**3177**
	300	**27**	**81**	**13**	**39**	**24**	**72**	**32**	**96**	**29**	**87**	**35**	**105**
	400	**12**	**36**	**6**	**17**	**7**	**21**	**10**	**30**	**14**	**42**	**13**	**39**
Total		**730**	**2190**	**748**	**2243**	**847**	**2619**	**882**	**2756**	**929**	**2924**	**1039**	**3321**

Course titles for Table G.

Course	Title	Cr Hr	Course	Title	Cr Hr
MATH			380	**History of Mathematics**	**3**
105	**Elements of Mathematics I**	**3**	386	**Geometries**	**4**
110	**College Mathematics-GTMA1**	**3**	389	**Explorations in Math**	**1**
113	**College Algebra-GTMA1**	**4**	394	**Mathematics Colloquium**	**1**
119	**Precalculus Mathematics-GTMA1**	**5**	396	**Topics**	**3**
121	**Calculus for Business**	**3**	415	**Abstract Algebra Sec Ed**	**3**
130	**Trigonometry**	**3**	420	**Introduction to Topology**	**3**
135	**Engineering Calculus I**	**4**	430	**Mathematical Logic**	**3**
136	**Engineering Calculus II**	**4**	450	**Complex Variables**	**3**
141	**Analytical Geometry**	**3**	452	**Intro to Real Analysis I**	**3**
146	**Calculus for Bio Sci**	**5**	453	**Intro to Real Analysis II**	**3**
151	**Calculus I-GT-MA1**	**5**	460	**Linear Algebra II**	**3**
152	**Calculus II**	**5**	484	**Senior Seminar I**	**2**
205	**Elements of Math II-GT-MA1**	**3**	490	**Abstract Algebra I**	**3**
236	**Diff Equat and Linear Algebra**	**4**	491	**Abstract Algebra II**	**3**
240	**Intro to Adv. Mathemathics**	**4**	494	**Senior Seminar II**	**2**
253	**Calculus III**	**4**	496	**Topics**	**3**
260	**Differential Equations**	**3**	**STAT**		
301	**Math for Elementary Teachers**	**3**	200	**Prob and Statistics-GT-MA1**	**3**
305	**Euclidean Geometry**	**3**	215	**Statistics for Soc/Behav Sci**	**4**
310	**Number Theory**	**3**	311	**Statistical Methods**	**3**
325	**Linear Algebra I**	**3**	313	**Sampling Techniques**	**3**
340	**Ethnomathematics**	**3**	350	**Mathematical Statistics I**	**3**
352	**Advanced Calculus**	**3**	351	**Mathematical Statistics II**	**3**
360	**Methods Appl Mathematic**	**3**	395	**Independent Study**	**3**
361	**Numerical Analysis**	**4**	396	**Top:State/Qual Cont Engineerin**	**3**
362	**Fourier Analysis**	**3**	412	**Correlation and Regression**	**3**
365	**Mathematical Modeling**	**3**	425	**Design/Analysis Experiments**	**3**
369	**Discrete Structures I**	**3**	495	**Independent Study**	**2-3**

Table G: Credit hour production by course

										Academic Year								
	2008-09			2009-10			2010-11			2011-12			2012-13			2013-14		
Course	Sects	Enroll	SCH	Sects	Enroll	SCH	Sects	Enroll	SCH	Sects	Enroll	SCH	Sects	Enroll	SCH	Sects	Enroll	SCH
MATH																		
105	**5**	**75**	**225**	**3**	**76**	**228**	**4**	**87**	**261**	**4**	**59**	**177**	**5**	**59**	**177**	**6**	**82**	**246**
110	**14**	**376**	**1128**	**15**	**470**	**1410**	**15**	**555**	**1665**	**19**	**537**	**1611**	**18**	**553**	**1659**	**17**	**495**	**1485**
113	**25**	**852**	**3408**	**31**	**1053**	**4212**	**36**	**1197**	**4788**	**39**	**1331**	**5324**	**42**	**1450**	**5800**	**40**	**1434**	**5736**
119	**4**	**134**	**670**	**6**	**162**	**810**	**6**	**178**	**890**	**8**	**217**	**1085**	**9**	**258**	**1290**	**9**	**305**	**1525**
121	**2**	**42**	**126**	**2**	**26**	**78**	**2**	**35**	**105**	**2**	**41**	**123**	**2**	**35**	**105**	**2**	**51**	**153**
130	**2**	**21**	**63**	**2**	**17**	**51**	**2**	**22**	**66**	**2**	**24**	**72**	**2**	**31**	**93**	**2**	**33**	**99**
135													**4**	**76**	**304**	**4**	**112**	**448**
136													**2**	**29**	**116**	**3**	**61**	**244**
141				**1**	**14**	**42**	**1**	**7**	**21**	**1**	**9**	**27**	**1**	**8**	**24**	**1**	**12**	**36**

Table G: Credit hour production by course (continued)

146	1	16	80	1	31	155	1	20	100	1	31	155	1	31	155	2	40	200
151	5	131	655	7	170	850	8	202	1010	9	220	1100	7	162	810	6	194	970
152	3	66	330	5	118	590	6	125	625	6	158	790	5	142	710	4	112	560
205	3	39	117	3	63	189	4	52	156	5	67	201	5	39	117	5	58	174
236				1	19	76	1	23	92	2	26	104	2	27	108	2	47	188
240	2	36	144	2	20	80	2	31	124	2	28	112	2	21	84	2	25	100
253	2	40	160	2	33	132	3	76	304	3	68	272	4	90	360	4	78	312
260	1	18	54	1	7	21	1	15	45	1	19	57	1	12	36	1	12	36
301	2	34	102	5	44	132	3	68	204	3	57	171	4	45	135	4	43	129
305	2	11	33	1	3	9	1	9	27	1	5	15	1	6	18			
310	1	5	15	1	7	21	1	7	21	1	6	18	1	4	12	1	5	15
325	1	13	39	2	19	57	2	25	75	2	17	51	2	23	69	2	22	66
340	1	1	3	2	7	21	1	2	6	1	1	3	2	2	6	2	2	6
352	1	6	18	1	14	42	1	4	12	1	8	24	1	6	18	1	4	12
360	1	6	18	1	6	18	1	8	24	1	5	15	1	7	21	1	5	15
361	1	10	40	1	8	32	1	12	48	1	10	40	1	13	52	1	9	36
362							1	16	48				1	14	42	1	13	39
365	1	6	18	1	5	15	1	9	27	1	13	39	1	10	30	1	12	36
369	2	26	78	1	25	75	2	31	93	2	31	93	2	36	108	2	34	102
380	1	12	36	1	9	27	1	7	21	1	12	36	1	12	36	1	10	30
386	1	6	24	1	10	40	1	7	28	1	11	44	1	12	48	1	9	36
389	2	7	7													1	9	9
394	1	7	21	2	13	13	3	11	11	2	16	16	2	18	18	2	4	4
396	1	1	2													1	3	9
415	1	7	21													1	3	9
420							1	3	9				1	4	12	1	2	6
430	1	7	21							1	10	30				1	8	24
450													1	6	18			
452				2	18	54				2	29	87	1	1	3	2	21	63
453				1	4	12				1	5	15				1	7	21
460	1	7	14	1	4	12				1	5	15				1	5	15
484	1	15	45	1	9	18	1	5	10	1	14	28	1	14	28	1	13	26
490	1	8	24				2	19	57				2	22	66			
491	1	7	14	1	1	3	1	9	27	1	4	12	1	7	21			
494	1	1	2	1	7	14	1	4	8	2	12	24	1	13	26	1	13	26
496				1	14	42				1	4	12	1	1	3	1	3	9
Total	95	2049	7755	110	2506	9581	118	2881	11008	132	3110	11998	142	3299	12738	142	3410	13255

Table G: Continued

							Academic Year											
	2008-09			2009-10			2010-11			2011-12			2012-13			2013-14		
Course	Sect	Enroll	SCH	Sect	Enroll	SCH	Sect	Enroll	SCH	Sect	Enroll	SCH	Sect	Enroll	SCH	Sect	Enroll	SCH
STAT																		
200	**18**	**691**	**2073**	**16**	**729**	**2187**	**18**	**738**	**2214**	**18**	**730**	**2190**	**18**	**749**	**2247**	**18**	**787**	**2361**
215							**3**	**78**	**312**	**4**	**110**	**440**	**4**	**137**	**548**	**6**	**204**	**816**
311	**1**	**11**	**33**	**1**	**7**	**21**	**1**	**11**	**33**	**1**	**9**	**27**	**1**	**12**	**36**	**1**	**10**	**30**
313	**1**	**6**	**18**	**1**	**2**	**6**	**1**	**5**	**15**	**1**	**12**	**36**	**1**	**7**	**21**	**1**	**4**	**12**
350	**1**	**5**	**15**	**1**	**2**	**6**	**1**	**4**	**12**	**1**	**6**	**18**	**1**	**5**	**15**	**1**	**10**	**30**
351	**1**	**5**	**15**	**1**	**2**	**6**	**1**	**4**	**12**	**1**	**5**	**15**	**1**	**4**	**12**	**1**	**6**	**18**
395													**1**	**1**	**3**			
396	1	5	15													1	5	15
412	1	6	18	1	3	9	1	7	21	1	7	21	1	4	12	1	5	15
425	1	1	3	1	2	6				1	3	9	1	10	30	1	8	24
495	0	0	0	1	1	2												
Total	**25**	**730**	**2190**	**23**	**748**	**2243**	**26**	**847**	**2619**	**28**	**882**	**2756**	**29**	**929**	**2924**	**31**	**1039**	**3321**

Table H: Credit Hours by Faculty Type

								Academic Year								
		2008-09			2009-10			2010-11			2011-12			2012-13		
Subject	Faculty Type	CCH	SCH	% SCH	CCH	SCH	% SCH	CCH	SCH	% SCH	CCH	SCH	% SCH	CCH	SCH	% SCH
MATH	**1 - T/TT**	**217**	**4590**	**59%**	**244**	**5397**	**49%**	**259**	**5329**	**44%**	**265**	**5404**	**42%**	**232**	**4654**	**35%**
	3 -FT NonTT	**55**	**1280**	**17%**	**142**	**4205**	**38%**	**134**	**3596**	**30%**	**146**	**3675**	**29%**	**212**	**6386**	**48%**
	5 - Admin /Coaches	**3**	**3**	**0%**	**3**	**6**	**0%**									
	6 -PT	**59**	**1882**	**24%**	**43**	**1400**	**13%**	**92**	**3073**	**26%**	**111**	**3659**	**29%**	**73**	**2215**	**17%**
Total		**334**	**7755**	**100%**	**432**	**11008**	**100 %**	**485**	**11998**	**100 %**	**522**	**12738**	**100 %**	**517**	**13255**	**100 %**
STAT	**1 - T/TT**	**60**	**1833**	**84%**	**35**	**981**	**37%**	**36**	**946**	**34%**	**34**	**806**	**28%**	**53**	**1553**	**47%**
	3 -FT NonTT	**9**	**153**	**7%**	**18**	**474**	**18%**	**24**	**774**	**28%**	**9**	**204**	**7%**	**25**	**886**	**27%**
	6 -PT	**6**	**204**	**9%**	**28**	**1164**	**44%**	**28**	**1036**	**38%**	**48**	**1914**	**65%**	**21**	**882**	**27%**
Total		**75**	**2190**	**100%**	**81**	**2619**	**100 %**	**88**	**2756**	**100 %**	**91**	**2924**	**100 %**	**99**	**3321**	**100 %**

Table I: Ratio of full-time equivalent students (FTES) to Full-time equivalent faculty (FTEF)

	Academic Year																	
	2008-09			2009-10			2010-11			2011-12			2012-13			2013-14		
Subject	FTES	FTEF	FTES: FTEF	FTES	FTEF	FTES: FTEF	FTES	FTEF	FTES: FTEF	FTES	FTEF	FTES: FTEF	FTES	FTEF	FTES: FTEF	FTES	FTEF	FTES: FTEF
MATH	55.5	5.4	10.3	319.4	16.7	19.2	366.9	18.0	20.4	399.9	20.2	19.8	424.6	21.8	19.5	441.8	21.5	20.5
STAT	258.5	13.9	18.6	74.8	2.8	26.4	87.3	3.4	25.9	91.9	3.7	25.1	97.5	3.8	25.7	110.7	4.1	26.8

Table J: First-time, full-time bachelor's-seeking freshmen students entering with a math major that were retained for the following fall.

Entry Fall	Freshmen Math Majors	Retained in Math	Retained other major	Not retained	% Retained in Math
2000	7	3	1	3	43%
2001	4	2	2	0	50%
2002	7	6	0	1	86%
2003	10	6	2	2	60%
2004	14	10	0	4	71%
2005	13	8	1	4	62%
2006	9	6	1	2	67%
2007	13	7	1	5	54%
2008	15	9	0	6	60%
2009	14	10	1	3	71%
2010	25	12	3	10	48%
2011	8	6	1	1	75%
2012	17	9	5	3	53%
2013	15	11	0	4	73%

Table K: First-time, full-time bachelor's-seeking freshmen students entering with a math major that graduated within six years.

Entry Fall	Freshmen Math Majors	Graduated in Math	Graduated other major	Did not Graduate	% Graduated in Math
2000	7	0	1	6	0%
2001	4	1	1	2	25%
2002	7	5	0	2	71%
2003	10	2	3	5	20%
2004	14	3	1	10	21%
2005	13	1	1	11	8%
2006	9	4	2	3	44%
2007	13	3	1	9	23%

Table L: Math Majors in Fall 2011 and 2012 with status the subsequent fall

					Status Fall 2012				
Degree Level	Major		Class Standing	# Fall 2011	Retained in major	Retained - same dept	Retained - other dept	Not Retained	Graduated
AA/AS	2425	**Liberal Arts, Mathematics**	**FR**	**2**	**0 (0%)**	**0 (0%)**	**1 (50%)**	**1 (50%)**	**0 (0%)**
			SO	**5**	**2 (40%)**	**1 (20%)**	**2 (40%)**	**0 (0%)**	**0 (0%)**
	2490	**Liberal Arts, Undec NatSc/Math**	**FR**	**14**	**4 (29%)**	**0 (0%)**	**3 (21%)**	**7 (50%)**	**0 (0%)**
			SO	**4**	**1 (25%)**	**1 (25%)**	**0 (0%)**	**2 (50%)**	**0 (0%)**
	Total			**25**	**7 (28%)**	**2 (8%)**	**6 (24%)**	**10 (40%)**	**0 (0%)**
Prov Bach	2942	**Mathematics Provisional Bacc**	**FR**	**1**	**0 (0%)**	**0 (0%)**	**1 (100%)**	**0 (0%)**	**0 (0%)**
			SO	**1**	**1 (100%)**	**0 (0%)**	**0 (0%)**	**0 (0%)**	**0 (0%)**

Table L: Math Majors in Fall 2011 and 2012 with status the subsequent fall (continued)

	Total			**2**	**1 (50%)**	**0 (0%)**	**1 (50%)**	**0 (0%)**	**0 (0%)**
BA	**3251**	**Liberal Arts, Elem Teaching, Math**	**JR**	**8**	**0 (0%)**	**0 (0%)**	**7 (88%)**	**1 (13%)**	**0 (0%)**
			SR	**11**	**0 (0%)**	**0 (0%)**	**4 (36%)**	**2 (18%)**	**5 (45%)**
	3402	**Mathematics , Pre-Teacher Ed**	**FR**	**2**	**1 (50%)**	**0 (0%)**	**0 (0%)**	**1 (50%)**	**0 (0%)**
			SO	**4**	**3 (75%)**	**0 (0%)**	**0 (0%)**	**1 (25%)**	**0 (0%)**
			SR	**2**	**0 (0%)**	**1 (50%)**	**0 (0%)**	**1 (50%)**	**0 (0%)**
	3424	**Mathematics**	**FR**	**3**	**3 (100%)**	**0 (0%)**	**0 (0%)**	**0 (0%)**	**0 (0%)**
			SO	**8**	**3 (38%)**	**0 (0%)**	**1 (13%)**	**4 (50%)**	**0 (0%)**
			JR	**11**	**7 (64%)**	**2 (18%)**	**0 (0%)**	**2 (18%)**	**0 (0%)**
			SR	**19**	**7 (37%)**	**3 (16%)**	**0 (0%)**	**2 (11%)**	**7 (37%)**
BA	3430	**Mathematics**	**FR**	**4**	**1 (25%)**	**0 (0%)**	**2 (50%)**	**1 (25%)**	**0 (0%)**
		Secondary Cert	**SO**	**5**	**3 (60%)**	**1 (20%)**	**1 (20%)**	**0 (0%)**	**0 (0%)**
			JR	**6**	**4 (67%)**	**0 (0%)**	**1 (17%)**	**1 (17%)**	**0 (0%)**
			SR	**9**	**5 (56%)**	**0 (0%)**	**3 (33%)**	**0 (0%)**	**1 (11%)**
	3434	**Mathematics -Statistics**	**FR**	**1**	**0 (0%)**	**1 (100%)**	**0 (0%)**	**0 (0%)**	**0 (0%)**
			SO	**2**	**1 (50%**	**0 (0%)**	**1 (50%)**	**0 (0%)**	**0 (0%)**
			JR	**1**	**1 (100%)**	**0 (0%)**	**0 (0%)**	**0 (0%)**	**0 (0%)**
			SR	**1**	**0 (0%)**	**0 (0%)**	**0 (0%)**	**1 (100%)**	**0 (0%)**
	Total			**97**	**39 (40%)**	**8 (8%)**	**20 (21%)**	**17 (18%)**	**13 (13%)**

Table M: Math Majors in Fall 2012 and 2013 with status the subsequent fall

					Status Fall 2013				
Degree Level	Major		Class Standing	# Fall 2012	Retained in major	Retained - same dept	Retained - other dept	Not Retained	Graduated
AA/AS	2425	**Liberal Arts, Mathematics**	**FR**	**3**	**2 (67%)**	**0 (0%)**	**0 (0%)**	**1 (33%)**	**0 (0%)**
			SO	**6**	**1 (17%)**	**0 (0%)**	**3 (50%)**	**2 (33%)**	**0 (0%)**
	2490	**Liberal Arts, Undec NatSc/Math**	**FR**	**7**	**0 (0%)**	**0 (0%)**	**1 (14%)**	**6 (86%)**	**0 (0%)**
			SO	**8**	**1 (13%)**	**0 (0%)**	**1 (13%)**	**6 (75%)**	**0 (0%)**
			SR	**14**	**5 (36%)**	**1 (7%)**	**2 (14%)**	**2 (14%)**	**4 (29%)**
	Total			**24**	**4 (17%)**	**0 (0%)**	**5 (21%)**	**15 (63%)**	**0 (0%)**

Table M: Math Majors in Fall 2012 and 2013 with status the subsequent fall (continued)

Prov Bach	2942	**Mathematics Provisional Bacc**	**SO**	**1**	**1 (100%)**	**0 (0%)**	**0 (0%)**	**0 (0%)**	**0 (0%)**
	Total			**1**	**1 (100%)**	**0 (0%)**	**0 (0%)**	**0 (0%)**	**0 (0%)**
BA	3251	**Liberal Arts, Elem Teaching, Math**	**JR**	**1**	**0 (0%)**	**0 (0%)**	**1 (100%)**	**0 (0%)**	**0 (0%)**
			SR	**11**	**0 (0%)**	**0 (0%)**	**5 (45%)**	**0 (0%)**	**6 (55%)**
	3402	**Mathematics , Pre-Teacher Ed**	**FR**	**9**	**6 (67%)**	**1 (11%)**	**1 (11%)**	**1 (11%)**	**0 (0%)**
			SO	**4**	**2 (50%)**	**0 (0%)**	**0 (0%)**	**2 (50%)**	**0 (0%)**
			JR	**3**	**0 (0%)**	**2 (67%)**	**1 (33%)**	**0 (0%)**	**0 (0%)**
			SR	**1**	**0 (0%)**	**0 (0%)**	**1 (100%)**	**0 (0%)**	**0 (0%)**
	3424	**Mathematics**	**FR**	**4**	**0 (0%)**	**0 (0%)**	**2 (50%)**	**2 (50%)**	**0 (0%)**
			SO	**5**	**3 (60%)**	**0 (0%)**	**1 (20%)**	**1 (20%)**	**0 (0%)**
			JR	**13**	**6 (46%)**	**2 (15%)**	**2 (15%)**	**3 (23%)**	**0 (0%)**
BA	3430	**Mathematics , Secondary Cert**	**FR**	**1**	**0 (0%)**	**0 (0%)**	**1 (100%)**	**0 (0%)**	**0 (0%)**
			SO	**1**	**1 (100%)**	**0 (0%)**	**0 (0%)**	**0 (0%)**	**0 (0%)**
			JR	**3**	**2 (67%)**	**0 (0%)**	**1 (33%)**	**0 (0%)**	**0 (0%)**
			SR	**11**	**5 (45%)**	**1 (9%)**	**0 (0%)**	**1 (9%)**	**4 (36%)**
	3434	**Mathematics -Statistics**	**FR**	**4**	**2 (50%)**	**0 (0%)**	**2 (50%)**	**0 (0%)**	**0 (0%)**
			JR	**1**	**1 (100%)**	**0 (0%)**	**0 (0%)**	**0 (0%)**	**0 (0%)**
			SR	**7**	**3 (43%)**	**0 (0%)**	**0 (0%)**	**1 (14%)**	**3 (43%)**
	Total			**93**	**36 (39%)**	**7 (8%)**	**20 (22%)**	**13 (14%)**	**17 (18%)**

Appendix E

Assessment and Student Learning Outcomes

GENERAL EDUCATION ASSESSMENT REPORT

MATH 110 (College Mathematics)
(Gen Ed Course - Department, Number, Title of Course)

2008/2009 academic year
(Assessment Period Covered)

9/14/2009
(Date Submitted)

Submitted By: **Markus Reitenbach**

General Education Objectives addressed by this course: (List a minimum of two)

1. The student should be able to understand the structure and discipline of mathematical thought and its use in problem-solving.

2. The student should be able to think critically and creatively.

(Please Copy and Paste to create space for additional GE Objectives, if necessary)

General Education Objective #1:

The student should be able to understand the structure and discipline of mathematical thought and its use in problem-solving.

First Means of Assessment for GE Objective #1:

1a. First Means of Assessment and Criteria for Success: A series of four multiple choice questions testing appropriate use of mathematical terminology and college level mathematics skills are given to all students taking MATH 110. Success means that at least 60% of students have three or more correct answers.

1a. Summary of Assessment Data Collected:
73% of students had three or more correct answers.

1a. Use of Results to Improve Gen Ed Course:
None. Course seems good as is. We kept the same textbook (new edition).

Second Means of Assessment for GE Objective #1:

1b. Second Means of Assessment and Criteria for Success:
The student has to answer a logic question using a truth table. The problem is graded on a 0-4 scale. Success means that at least 60% of students get at least 3 out of 4 points.

1b. Summary of Assessment Data Collected:
70% of students got at least 3 out of 4 points.

1b. Use of Results to Improve Gen Ed Course:
None.

General Education Objective #2:

The student should be able to think critically and creatively.

First Means of Assessment for GE Objective #2:

2a. First Means of Assessment and Criteria for Success:
A series of four multiple choice questions testing critical and creative thinking skills are given to all students taking MATH 110. Success means that at least 60% of students have three or more correct answers.

2a. Summary of Assessment Data Collected:
67% of students got at least 3 out of 4 points.

2a. Use of Results to Improve Gen Ed Course:
None.

Second Means of Assessment for GE Objective #2:

2b. Second Means of Assessment and Criteria for Success:
The student has to solve a counting problem using Venn diagrams and/or appropriate counting formulas. The problem is graded on a 0-4 scale. Success means that at least 60% of students get at least 3 out of 4 points.

2b. Summary of Assessment Data Collected:
75% of students got at least 3 out of 4 points.

2b. Use of Results to Improve Gen Ed Course:
None.

MATH 110 Assessment Questions

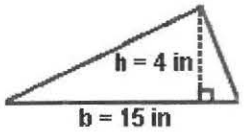
Objective #1 (The student should be able to understand the structure and discipline of mathematical thought and its use in problem-solving.)

1. Are the following statements true (T) or false (F)? (4 points)

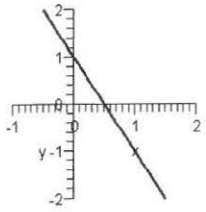
The intersection of the sets {1,3,5} and {3,7} is {1,3,5,7}. T F

A price change from $150 to $120 corresponds to a price reduction by 25 percent. T F

The triangle graphed below has an area of 30 square inches. T F



The line graphed below has a slope of +2. T F



2. Given statements p and q, construct a truth table to determine if the statement $p \wedge (p \vee q)$ is logically equivalent to the statement $p \wedge q$. Justify your answer. (4 points)

Objective #2 (The student should be able to think critically and creatively.)

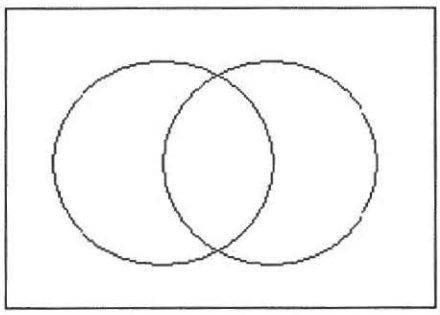
1. Are the following statements true (T) or false (F)? (4 points)

For the data set 2 3 5 7 13 the median is less than the mean.	T	F
When you roll two dice, the probability of rolling a sum of five is 5/36.	T	F
Investing \$200 for 2 years compounded annually at 5% interest per year has a higher yield than investing \$200 for 2 years compounded monthly at 4.75% interest per year.	T	F
A foundation awards 4 identical scholarships to 20 applicants. No applicant can receive more than one award. There are 116,280 ways of choosing the 4 awardees.	T	F

2. A survey of 100 high school students reveals that 40 of them like Math, 33 like both Math and Physics, and 50 of them like neither Math nor Physics. (4 points)

(a) How many students like Physics but not Math?

(b) How many students like Physics?



GENERAL EDUCATION ASSESSMENT REPORT

MATH 113 – College Algebra
(Gen Ed Course - Department, Number, Title of Course)

2008/09 academic year **9/14/2009**
(Assessment Period Covered) **(Date Submitted)**

Submitted By: **Markus Reitenbach**

General Education Objectives addressed by this course: (List a minimum of two)

1. The student should be able to understand the structure and discipline of mathematical thought and its use in problem-solving.

2. The student should be able to think critically and creatively.

(Please Copy and Paste to create space for additional GE Objectives, if necessary)

General Education Objective #1:

The student should be able to understand the structure and discipline of mathematical thought and its use in problem-solving.

First Means of Assessment for GE Objective #1:

1a. First Means of Assessment and Criteria for Success:
A series of four multiple choice questions testing appropriate use of mathematical terminology and college level mathematics skills are given to all students taking MATH 113. Success means that at least 60% of students have three or more correct answers.

1a. Summary of Assessment Data Collected:
48% of students got at least 3 out of 4 points.

1a. Use of Results to Improve Gen Ed Course:
See (1b) below.

Second Means of Assessment for GE Objective #1:

1b. Second Means of Assessment and Criteria for Success:
The student is asked to solve a quadratic inequality. This can be done either algebraically or using a graphing calculator. The problem is graded on a 0-4 scale. Success means that at least 60% of students get at least 3 out of 4 points.

1b. Summary of Assessment Data Collected:
47% of students got at least 3 out of 4 points.

1b. Use of Results to Improve Gen Ed Course:
The results of (1a) and (1b) reflect the low pass rates (i.e., grade C or better) of College Algebra, which have historically been around 50% nationwide and slightly higher at Mesa State College. The department has made numerous attempts to the further improve our pass rate. These included a proposal to raise the required ACT score for admission into MATH 113, as well as teaching the class using a modeling-based approach (as done by Dr. Friedman and Dr. Cathy Bonan-Hamada, who both participated in a national study of this approach). Last semester, we switched the textbook. This semester, we started offering sections geared towards weaker students with an additional hour of meeting time. We noticed big differences in student performance across sections, so we will try to find identify possible reasons and/or confounding variables explaining these differences.

General Education Objective #2:

The student should be able to think critically and creatively.

First Means of Assessment for GE Objective #2

2a. First Means of Assessment and Criteria for Success:
A series of four multiple choice questions testing critical and creative thinking skills are given to all students taking MATH 113. Success means that at least 60% of students have three or more correct answers.

2a. Summary of Assessment Data Collected:
81% of students got at least 3 out of 4 points.

2a. Use of Results to Improve Gen Ed Course:
See (2b) below.

Second Means of Assessment for GE Objective #2

2b. Second Means of Assessment and Criteria for Success:
The student has to solve an applied problem involving an exponential model. The problem is graded on a 0-4 scale. Success means that at least 60% of students get at least 3 out of 4 points. The problem is graded on a 0-4 scale. Success means that at least 60% of students get at least 3 out of 4 points.

2b. Summary of Assessment Data Collected:
40% of students got at least 3 out of 4 points.

2b. Use of Results to Improve Gen Ed Course:
Looking at the actual answers, one can see that the very low score of 40% in question (2b) is not caused by the students' inability to use the exponential model to solve a real-life problem, but rather by their lack of mechanical algebra skills to solve such an equation. Student success is limited by the following factors: 1. a large percentage of under-prepared students with poor study skills, 2. the large amount of prerequisite material to be reviewed to help the weaker students catch up, 3. the large amount of actual College Algebra material to be covered, 4. the relatively limited time of 4 credit hours (compared to Precalculus, which is a 5 credit hour class). We believe that the introduction of FYI classes is a step in the right direction to improve students' study skills. We started using MyMathLab, an online homework system that has shown to make students spend more time on homework in our STAT 200 class. It was also suggested by some faculty to offer a College Algebra class for business majors with a more streamlined curriculum, so we will look into that.

MATH 113 Assessment Questions

Objective #1 (The student should be able to understand the structure and discipline of mathematical thought and its use in problem-solving.)

1. Are the following statements true (T) or false (F)? (4 points)

The absolute value function $f(x)=\|x\|$ is one-to-one.	T	F
If $x, y > 0$ then $(x + y)^{-1} = x^{-1} + y^{-1}$.	T	F
The lines given by $y=2x+1$ and $4x-2y+5=0$ are parallel.	T	F
If $x, y > 0$ then $\frac{\log x}{\log y} = \log(x) - \log(y)$.	T	F

2. Solve the inequality $2x^2 \leq 8x - 6$. Give your answer in interval notation. (4 points)

Objective #2 (The student should be able to think critically and creatively.)

1. Are the following statements true (T) or false (F)? (4 points)

The point (0,1) lies on the circle given by $(x - 1)^2 + y^2 = 4$	T	F
x - 2 is a factor of $x^4 - 2x^3 + 2x - 4$.	T	F

If $f(x) = 2x$ and $g(x) = x + 3$, then $f(g(x)) = 2x + 6$. T F

The pair (0,1) is a solution of the system of linear equations T F

$$2x + y = 1$$
$$x - y = 1$$

2. After a person dies, the core temperature y of the corpse is given by
$y = A + (98.6 - A)(0.823)^t$,
where A is the surrounding air temperature and t the time in hours after death. If a murder victim is found in a 60 degree basement and its body temperature was measured to be 72 degrees, how long ago was the person murdered? (4 points)

Rubrics for Senior Seminar

The Rubric for Senior Seminar research papers is based on a 30 point scale that looks at:

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 the presentation portion is based on a 20 point assessment that grades the following:

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

Table 5.1 Mathematics SLO Assessment Plan (9/13/2013)

Program Outcomes	Courses/Educational Strategies Indicate if outcome is Beginning(B), Developing(D) or Advanced(A)	Assessment Method(s)	Time of Data Collection/ Person Responsible
Outcome #1 Students will construct multi-step problem-solving strategies, and communicate solutions effectively in written form.	Math 253 Calculus III (D)	**What:** Test **How:** Final exams will contain one or more standard questions, graded according to a common rubric. Examples: 1. Write the equation of a plane in space. 2. Calculate the length of a curve in space. 3. Find the potential function of a vector field.	**Who:** Course instructor **When:** End of each semester
	Math 325 Linear Algebra I (A)	**What:** Test **How:** Final exams will contain one or more standard questions, graded according to a common rubric. Examples: 1. Find a matrix representation of an abstract linear transformation. 2. Diagonalize a linear transformation by finding its eigenvalues and eigenvectors.	
Outcome #2 Students will use mathematical software (including calculators) to aid in problem-solving and investigation, and understand its limitations.	Math 253 Calculus III (D) Math 325 Linear Algebra I (A)	**What:** Test **How:** As above.	**Who:** Course instructor **When:** End of each semester
Outcome #3 Students will prove propositions deductively from definitions and theorems, using clear and precise prose.	Math 240 Introduction to Advanced Mathematics (B) Math 452 Real Analysis I (A) Math 490 Abstract Algebra I (A)	**What:** Homework portfolio **How:** Each student will assemble a portfolio of approximately six proofs selected from the homework. Portfolios will be assessed according to a common rubric.	**Who:** Course instructor **When:** End of each semester
Outcome #4 Students will learn an area of mathematics deeply and deliver substantial written and oral presentations of this area.	Math 494 Senior Seminar II (A)	**What:** Thesis and oral presentation **How:** Each mathematics major will conduct independent research culminating in a thesis and oral presentation, which are assessed according to a common rubric.	**Who:** Course instructor **When:** End of each spring semester

Table 5.2 Mathematics Secondary Education Assessment Plan (9/13/2013)
Template adapted from Long Beach City College and Indiana State University Assessment Plans

Program Outcomes	**Courses/Educational Strategies Indicate if outcome is Beginning(B), Developing(D) or Advanced(A)**	**Assessment Method(s)**	**Time of Data Collection/ Person Responsible**
Outcome #1 Students will construct multi-step problem-solving strategies and communicate solutions effectively in written form.	Math 253 Calculus III (D)	**What:** Test **How:** Final exams will contain one or more standard questions, graded according to a common rubric. Examples: 1. Write the equation of a plane in space. 2. Calculate the length of a curve in space. 3. Find the potential function of a vector field.	**Who:** Course instructor **When:** End of each semester
	Math 325 Linear Algebra I (A)	**What:** Test **How:** Final exams will contain one or more standard questions, graded according to a common rubric. Examples: 1. Find a matrix representation of an abstract linear transformation. 2. Diagonalize a linear transformation by finding its eigenvalues and eigenvectors.	
	Educ 497c Methods of Teaching Secondary Mathematics (D)	**What:** Homework **How:** Each student will solve a multi-step problem and present his or her method and solution in written form.	

Table 5.2 continued
Template adapted from Long Beach City College and Indiana State University Assessment Plans

Outcome #2 Students will use mathematical software (including calculators) to aid in problem-solving and investigation, and understand its limitations.	Math 253 Calculus III (D) Math 325 Linear Algebra I (D)	**What:** Test **How:** As above.	**Who:** Course instructor **When:** End of each semester
Outcome #3 Students will prove propositions deductively from definitions and theorems, using clear and precise prose.	Math 240 Introduction to Advanced Mathematics (B) Math 352 Advanced Calculus (D) Math 415 Abstract Algebra for Secondary Education (A)	**What:** Homework portfolio **How:** Each student will assemble a portfolio of approximately six proofs selected from the homework. Portfolios will be assessed according to a common rubric.	**Who:** Course instructor **When:** End of each semester
Outcome #4 Students will demonstrate familiarity with the logical and historical development of mathematics and the implications of this development.	Math 380 History of Mathematics (D)	**What:** Projects **How:** Each student will assemble a portfolio of approximately four projects on historical mathematics topics, and these portfolios will be assessed according to a common rubric.	**Who:** Course instructor **When:** End of each spring semester
Outcome #5 Students will effectively communicate mathematics using oral and written exposition appropriate for teachers of mathematics.	Educ 497c Methods of Teaching Secondary Mathematics (A)	**What:** Homework and presentations **How:** Each student will solve a multi-step problem and present his or her method and solution in both written and oral form. Each student will also prepare and present a lesson plan for secondary mathematics that will be assessed using a common rubric.	**Who:** Course instructor **When:** End of each spring semester

Table 5.3 Statistics Concentration SLO Assessment Plan (9/13/2013)

Program Outcomes	Courses/Educational Strategies Indicate if outcome is Beginning(B), Developing(D) or Advanced(A)	Assessment Method(s)	Time of Data Collection/ Person Responsible
Outcome #1 Students will construct multi-step problem-solving strategies, and communicate solutions effectively in written form.	Stat 200 Probability and Statistics(B) Stat 350 Mathematical Statistics I(D)	**What:** Test **How:** Final exams will contain one or more standard questions, graded according to a common rubric. Examples in Stat 200: 1. Perform a one-sample t-test. 2. Perform a two-sample t-test for means. 3. Perform a two-sample test for proportions. 4. Calculate conditional probabilities and test for independence. Examples in Stat 350: 1. Find the moment generating function for a specified distribution, and use it to find the mean and variance. 2. Perform a two-by-two transformation of variables in order to find the distribution of the difference of two random variables. 3. Find the conditional expectation given a joint distribution.	**Who:** Course instructor **When:** End of each semester
Outcome #2 Students will use statistical software (including calculators) to aid in problem-solving and investigation, and understand its limitations.	Stat 200 Probability and Statistics (B) Stat 350 Mathematical Statistics I (D) Stat 412 Correlation and Regression (A) Stat 425 Design and Analysis of Experiments (A)	**What:** Test and homework **How:** As above for Stat 200 and 350. In Stat 412 and 425, students will submit homework reports of a multivariate regression analysis using R and a two-way ANOVA using R, respectively.	**Who:** Course instructor **When:** End of each semester
Outcome #3 Students will apply appropriate statistical procedures and justify chosen assumptions.	Stat 350 Mathematical Statistics I (D) Stat 412 Correlation and Regression (A) Stat 425 Design and Analysis of Experiments (A)	**What:** Test and homework **How:** Stat 350 as above. In Stat 412 and 425, students will submit homework reports that include an introduction, clearly stated hypotheses, justification of assumptions, analysis implemented, results, and a conclusion.	**Who:** Course instructor **When:** End of each semester
Outcome #4 Students will draw statistical conclusions and evaluate the validity of others' conclusions.	Stat 412 Correlation and Regression (A) Stat 425 Design and Analysis of Experiments (A)	**What:** Homework **How:** As above.	**Who:** Course instructor **When:** End of each semester

Table 5.4 Mathematics SLO Course Map

	B - Beginning Level	D - Developing	A - Advanced	
Mathematics SLO	Students will construct multi-step problem-solving strategies, and communicate solutions effectively in written form.	Students will use mathematical software (including calculators) to aid in problem-solving and investigation, and understand its limitations.	Students will prove propositions deductively from definitions and theorems, using clear and precise prose.	Students will learn an area of mathematics deeply and deliver substantial written and oral presentations of this area.
MATH 110	B	B		
College Math				
MATH 113	B	B		
College Algebra GTMA				
MATH 119	B	B		
Precalculus				
MATH 121	B	B		
Calculus for Business				
MATH 130	B	B		
Trigonometry				
MATH 146	B	B		
Calculus for Biological Sciences				
MATH 151	D	B		
Calculus I GT-MA1				
MATH 152	D	B		
Calculus II				
MATH 196	D	D		
Topics				
MATH 236	D	D		
Differential Equations & Linear Algebra				
MATH 240	D		B	
Intro to Advanced Mathematics				
MATH 253	D	B		
Calculus III				
MATH 260	D	B		
Differential Equations				
MATH 296	D			
Topics				

Table 5.4 Mathematics SLO Course Map (continued)

	B - Beginning Level	D - Developing	A - Advanced	
Mathematics SLO	Students will construct multi-step problem-solving strategies, and communicate solutions effectively in written form.	Students will use mathematical software (including calculators) to aid in problem-solving and investigation, and understand its limitations.	Students will prove propositions deductively from definitions and theorems, using clear and precise prose.	Students will learn an area of mathematics deeply and deliver substantial written and oral presentations of this area.
MATH 305	D		B	
Euclidean Geometry				
MATH 310	D		D	
Number Theory				
MATH 325	D	D	D	
Linear Algebra I				
MATH 360	D	D		
Methods of Applied Math				
MATH 361	D	A		
Numerical Ananlysis				
MATH 362	A	A		
Fourier Analysis				
MATH 365	D	D		
Mathematical Modeling				
MATH 369	D		B	
Discrete Structures I				
MATH 386	D		D	
Geometries				
MATH 395				
Independent Study				
MATH 396	A			
Topics				
MATH 397	A			A
Structured Research				
MATH 420	A		A	
Intro to Topolgy				
MATH 430	A		A	
Mathematical Logic				
MATH 450	A	D	D	
Complex Variables				
MATH 452	A		A	
Intro to Real Analysis I				
MATH 453	A		A	
Intro to Real Analysis II				

Table 5.4 Mathematics SLO Course Map (continued)

MATH 460	A	D	A	
Linear Algebra II				
MATH 484		D		
Senior Seminar I				
MATH 490	A		A	
Abstract Algebra I				
MATH 491	A		A	
Abstract Algebra II				
MATH 494	A	D		A
Senior Seminar II				

Table 5.5 Mathematics Secondary Education SLO Course Map

	B - Beginning	D - Developing	A - Advanced		
Mathematics SLO	Students will construct multi-step problem-solving strategies, and communicate solutions effectively in written form.	Students will use mathematical software (including calculators) to aid in problem-solving and investigation, and understand its limitations.	Students will prove propositions deductively from definitions and theorems, using clear and precise prose.	Students will demonstrate familiarity with the logical and historical development of mathematics and the implications of this development.	Students will effectively communicate mathematics using oral and written exposition appropriate for teachers of mathematics.
Math 105	B				
Elements of Math I					
MATH 141	B	B	B		
Analytical Geometry					
MATH 205	B				
Elements of Math II GT-MA1					
MATH 301	D				
Math for Elementary Teachers					
MATH 340				D	
Ethnomathematics					
MATH 352	A		D		
Advanced Calculus					
MATH 380				D	
History of Mathematics					

Table 5.5 Mathematics Secondary Education SLO Course Map (continued)

MATH 386	D		D		
Geometries					
MATH 394				D	
Mathematics Colloquium					
MATH 415	A		A		
Abstract Algebra for Secondary Education					
EDU 497c	D				A
Methods of Teaching Secondary Mathematics					

Note: Math 105, 141, 205, and 301 support the Elementary Education program, and are not part of the Mathematics Secondary Education Program. Math 340 and 394 are not required, but they primarily serve education majors.

Table 5.6 Statistics SLO Course Map

	B - Beginning	D - Developing	A - Advanced	
Statistics SLO	Students will construct multi-step problem-solving strategies, and communicate solutions effectively in written form.	Students will use statistical software (including calculators) to aid in problem-solving and investigation, and understand its limitations.	Students will apply appropriate statistical procedures and justify chosen assumptions.	Students will draw statistical conclusions and evaluate the validity of others' conclusions.
STAT 200	B	B	B	B
Prob & Stats				
STAT 215	B	B	B	B
Stats for the Social Sciences				
STAT 311	D	D	D	
Statistical methods				
STAT 313	D	D	D	
Sampling Techniques				
STAT 350	D	D	D	
Mathematical Stats I				
STAT 351	D	D	D	
Mathematical Stats II				
STAT 395				
Independent Study				

Table 5.6 Statistics SLO Course Map (continued)

STAT 396	D	D	D	D
Topics				
STAT 412	A	A	A	A
Correlation & Regression				
STAT 425	A	A	A	A
Experimental Design				
STAT 495	A	A	A	A
Independent Study				
STAT 496	A	A	A	A
Topics				

Appendix F

Library Liaison Report and Timeline for Program Changes

Library Program Assessment
John U. Tomlinson Library
Colorado Mesa University

Date of Assessment: September 24, 2014

Purpose of Assessment: Program Evaluation

Program under review: Mathematics

Program Level/s: BS

Liaison Signature: Jamie Walker

1. Collection Assessment

This assessment was prepared using Library of Congress Subject Headings, except for MathSciNet which was searched with keywords. Subject headings were chosen to reflect math courses listed in the Colorado Mesa University 2014-2015 Catalog.

a. Reference Support: There are 28 books in the "QA" (mathematics) section of the reference area with some additional math related titles elsewhere in the Reference collection. Computer science materials in the QA section were excluded. Online dictionaries in mathematics and related fields are also available through the library's Oxford Reference subscription.

b. Monographic Sources (print and online): The Tomlinson Library Online Catalog (CMU) was searched for locally available books including e-books. Searches were done for all print monographic materials and then limited to those published from 2004. The Prospector catalog was also searched to determine what might be readily available from other libraries without regard to date. A subject keyword search of the online catalog using the term "mathematics" resulted in over 8,000 items. More specific searches are presented here:

Subject Heading	CMU All Print	CMU 2004-Print	CMU E-Books	Prospector
Mathematics	787	186	1,292	46,272
Statistics	90	10	181	124,414
Algebra	129	5	89	6,994
Calculus	72	7	68	4,666
Trigonometry	23	0	2	2,069
Business mathematics	18	1	38	1,486
Differential equations	33	0	188	7,625
Number theory	70	7	72	2,049
Ethnomathematics	2	0	1	31
Numerical analysis	38	3	79	3,142
Fourier analysis	12	2	25	436
Mathematical models	252	39	1,486	36,908
Mathematics – History	77	23	64	1,843
Geometry	84	5	106	12,066
Topology	56	4	49	2,133
Logic, Symbolic and mathematical	77	15	114	2,655
Functions of complex variables	24	0	39	1,089
Mathematical analysis	63	10	114	5,031

c. Electronic Resources: The library subscribes to a number of electronic resources suitable for those researching mathematical topics. E-books are a resource that is growing each year, and the above chart under Monographic Sources shows we have a significant amount of these. Given the e-books are relatively new on the market, most of them have been published within the last 10 years. The library also subscribes to a number of databases that suitable for mathematical research. Foremost would be the MathSciNet that provides indexing and abstracts to articles and books back to the early 1800s. Additional indexing, much with full text can be found in Academic Search Complete. Through the library's 88 databases university researchers have indexing to over 70,000 journal titles, over 30,000 of which are full text.

d. Periodicals (print and online): The library subscribes to about a dozen individual mathematics journals, about half of which remain in print, with the other half switched to online access. The MathSciNet database, containing almost 3 million items with over 1.7 million links to full-text was searched for mathematics related articles. The Academic Search Complete database (ASC) was searched for general journal publications. ASC indexes nearly 14,000 journals with 9,000 in full-text. ASC has partial full-text coverage from current back as far as 1887, but coverage is primarily from the late 1980s onward. Finally, the EBSCO Discovery Services database (EDS) was searched to uncover resources beyond ASC. EDS allows searching across several of CMU's databases including ASC. Results of individual searches are shown in the table below. These search results suggest there is a significant

amount of material available in periodical resources, some immediately with online full text. Journal literature not available through Colorado Mesa University can be provided by the Interlibrary Loan Department. Article requests are provided through 2 programs, RapidILL and OCLC Resource Sharing. RapidILL gives access to 245 academic library journal collections. The average amount of time it takes to fill an article request is 12 hours. Most requests are filled through this program. Beyond that, OCLC Resource Sharing gives access to 72,000 library collections world-wide. Both of these programs also provide book chapters as scanned documents.

2. Evaluation of the total collection

Subject Heading	MathSciNet	Academic Search Complete	EDS
Mathematics	1,112,953	330 312	520 471
Statistics	189,939	330,074	799,398
Algebra	216,815	76,799	93,903
Calculus	30,926	19,448	25,346
Trigonometry	676	837	1,488
Business mathematics	0	94	3,081
Differential equations	173,916	79,769	92,758
Number theory	19,884	9,167	22,530
Ethnomathematics	14	72	220
Numerical analysis	8,964	97,238	124,932
Fourier analysis	2,821	5,273	19,599
Mathematical models	12,100	129,159	436,233
Mathematics – History	22	411	3,226
Geometry	93,100	55,157	78,367
Topology	71,297	25,752	33,782
Logic, Symbolic and mathematical	46,330	3,992	6,254
Functions of complex variables	102	677	3,111
Mathematical analysis	72,510	76,162	266,160

a. Strengths: The library collection has a good selection of resources across most of the subject areas listed above. Both monographs and journal articles are well represented. Further support is available through Prospector or interlibrary loan.

b. Weaknesses: A few monographic areas are weak, such as "ethnomathematics", "business mathematics", other areas such as "functions of complex variables" or "differential equations" lack recent materials.

3. Recommendations: Attention should be given to areas that appear week and supportive materials should be ordered where appropriate. Existing funds should be adequate to purchase new materials.

Library Director: _____ Date: _____

Timeline for potential implementation of a concentration in applied mathematics

- Spring 2014: Create an exploratory committee
  This committee met weekly during the spring 2014 semester and accomplished the following items:
  - Determination of a need for and interest in such a program based on feedback from mathematics students and faculty members from partner disciplines.
  - Researched applied mathematics programs at many other universities, include several peer institutions.
  - Developed several possible ways to organized an applied mathematics concentration that would be suitable for our program

- Spring 2015: Create a proposal for an applied mathematics concentration
  The committee will solicit input from partner disciplines on current proposals. The partner disciplines include, but are not limited to, Physics, Computer Science, Biological Sciences, Chemistry, Engineering and Business. We hope to devise a format that will be flexible enough to accommodate student requests to partner with many other disciplines as well.

- Spring 2015: Submit proposal to full Mathematics faculty
  The committee will work with the Mathematics faculty

- Fall 2015: Submit proposal approved by Mathematics faculty to Curriculum Committee

- Fall 2016: Begin offering the concentration in Applied Mathematics

Timeline for investigation of Freshman/Sophomore seminar

- Spring 2015:
  - Create committee, sketch a proposal, and seek departmental feedback
  - If possible, revise proposal and present to Department for a vote
- Fall 2015:
  - If proposal is approved by Department, submit paperwork to Curriculum Committee
  - If proposal is approved by Department, run the seminar as a topics course

Timeline for investigation of revisions to Senior Seminar

- Spring 2015:
  - Create committee, sketch a proposal, and seek departmental feedback
  - If possible, revise proposal and present to Department for a vote
- Fall 2015:
  - If proposal is approved by Department, submit paperwork to Curriculum Committee
- Fall 2016:
  - Revised Senior Seminar in place

Appendix G

5 Year Budget History

5 Year Budget Data for 1465 – Mathematics & Statistics											
		FY10		FY11		FY12		FY13		FY14	
Expenditures	Banner Acct #	$	FTE	$	FTE	$	FTE	$	FTE	$	FTE
Classified Salaries – Reg FT	5006	30,876		30,876		30,876		30,876		31,339	
Classified Salaries – Reg PT	5026										
Retirement Classified Staff	2166	4,276		4,554		4,832		5,110		5,469	
Worker's Compensation Insurance	5196										
Tuition Reimbursement (Other Benefits)	5246										
Insurance Classified Staff	5216	5,166		1,163		5,313		780		5,756	
Contractual – Reg FT	5256	809,327	14.00	803,835	14.00	833,036	14.00	848,180	14.00	838,369	13.00
Contractual – Summer Faculty	5266										
Contractual – Reg PT	5276										
Contractual – Temp FT	5286	33,488	0.80	34,375	0.80	70,080	1.60	151,747	3.20	246,600	4.80
Contractual – Temp PT	5296	35,600	1.78	50,000	2.50	101,821	2.60	101,821	2.60	101,821	2.60
Contractual – Overload	5366										
CN – Other Retirement Plan	5456									99,402	
Retirement Contractual	5466	104,231		112,672		131,129		145,379		54,939	
Insurance Contractual	5516	107,518		110,138		137,940		195,524		184,575	
Worker's Compensation Insurance	5496										
Unemployment	5486										
Wellness (Other Benefits)	5476										
Tuition Reimbursement	5546										
Student Worker's Compensation Ins.	5556										
Federal Workstudy Match	5606										
Student Assistants	5706	1,000		1,515		1,000		1,000		2,250	
Professional Fees	6100										
Employee Travel – In State	6150	8,400		8,400		8,400		8,400		8,400	

5 year budget history (continued)

	Student Travel – In State	6155										
	Faculty Supervisory Travel – In State	6151										
	Employee Travel – Out of State	6160										
	Student Travel – Out of State	6165										
	Software Maintenance	6196										
	Supplies	6201	5,200		5,200		5,200		5,200		5,200	
	Supplies – Course Fee Funded	6203					2,150		2,150		2,150	
	Software Maintenance	6211										
	Printing Off Campus	6230										
	Telecommunications	6255										
	Subscriptions & Books	6310										
	Telephone Calls	6401	532		532		532		532		532	
	Telephone Equipment	6410	10,944		10,944		10,944		10,944		10,944	
	Postage	6430	228		228		228		228		228	
	Dues & Membership	6470										
	Advertising	6480										
	Equipment Repair & Maint.	6501	375		375		375		375		375	
	Maintenance Supplies	6550										
	Rent/Lease Equipment	6760	5,625		5,625		5,625		5,625		5,625	
	Official Functions	6850										
	Other Costs	6980										
	Professional Development	7150										
	Capital Equipment	8090										
	Equipment	8100										

External Program Review

Colorado Mesa University

Mathematics Program

conducted by:

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Review of Mathematics Program, Colorado Mesa University

Janet Beery, Professor of Mathematics, University of Redlands

Executive Summary Template for External Reviewer's Observations

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 the program.	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				
Student demand/enrollment is at an expected level in the context of the institution and program's role and mission.	X	Please	see report:	More students	should take advantage of the excellent major (and minor) programs!
The program's teaching-learning environment fosters success of the program's students.	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	Please	see report:	Facilities are	adequate but could be improved.
Equipment meets the program's needs.	X	Please	see report:	There may be	some hardware and software
Instructional technology meets the program's needs.	X	needs	that could	be met via	better and more frequent communication with IT.
Current library resources meet the program's needs.	X				
Student learning outcomes are appropriate to the discipline, clearly stated, measurable, and assessed.	X				
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				

Review of Mathematics Program
Colorado Mesa University

Janet Beery, Professor of Mathematics, University of Redlands

Introduction

The present review of the Mathematics Program at Colorado Mesa University is based primarily upon

1) careful consideration of the Mathematics Program Self-Study,
2) perusal of the university's website and, in particular, the Mathematics Program's webpages, and
3) a site visit on Monday, April 20, 2015, that included meetings with:
   Carol Futhey, Provost and VPAA;
   Steve Werman, AVPAA;
   Gillian McKnight-Tutein, AVPAA, Distance Learning;
   Sylvia Rael, Library Director;
   Jay Ballenberger, Instruction and Reference Librarian (Liaison to Mathematics);
   Bette Schans, Director of Assessment;
   Jeremy Brown, IT Director;
   Lori Payne, Computer Science, Mathematics, and Statistics Department Chair;
   Mathematics faculty members Chris Aquinto, Cathy Bonan-Hamada, Ed Bonan-Hamada, Lisa Driskell, Darren Gemoets, Phil Gustafson, Rick Ott, Markus Reitenbach, and Shawn Robinson;
   five recent CMU Mathematics graduates; and
   eight current CMU Mathematics majors.

This review is also informed by

- my experience at my own institution (a small private comprehensive university with a liberal arts emphasis);
- reviews of other colleges and universities and less formal visits to many others;
- my participation in discussions of undergraduate mathematics education at regional and national conferences and in professional publications; and
- recommendations about undergraduate mathematics education from the Mathematical Association of America (MAA).

I very much enjoyed my visit to Colorado Mesa University, where I found administrators and mathematics faculty alike to be committed to student-centered education, and both current students and recent graduates to be very appreciative of the mathematics faculty's excellent teaching and advising. My visit confirmed the portrayal in the self-study of a strong, comprehensive program and an energetic, thoughtful faculty always looking for ways to improve its curriculum and instruction.

Most Exemplary Element and Most Important Improvement

The CMU Mathematics Program's greatest strength, in my view, is its success in creating what feels very much like a major program in a small, expensive, liberal arts college. For

its majors in all three tracks, the program is personalized, with the faculty taking care to provide excellent and effective advising, instruction, and support to each student. At the same time, CMU mathematics faculty members understand clearly the importance of mathematics and statistics within a comprehensive public university. For students in its general education and service courses, instruction may not be quite as personalized, but I was impressed by the efforts the faculty have made to help students succeed in these courses as well. I was also impressed by the statistics (and mathematics) faculty's willingness to work with other departments and programs on campus to provide instruction in introductory statistics.

The program's major, with its three tracks in "pure" mathematics, statistics, and secondary education, appears to be rigorous, but flexible and accessible enough for students to succeed, and very effective. Although there may be more room for improvement in the program's general education and service courses than in the major, within the context of current resources I believe the greatest improvement to be made is for the program and its faculty to attract larger numbers of students to its excellent, personalized mathematics major. It's a great program and an excellent value and more students should benefit from it! Not so many majors that the program loses its personal touch, of course, but there is more space in the major courses than elsewhere for additional students and a dozen or so more per year could benefit from the strong sense of community among the majors and the careful attention of the faculty to its majors. (The program might aim for an average of at least eight majors per year in each of the mathematics, statistics, and secondary education tracks.) For average-to-good high school or community college students, CMU would seem to me to offer a greater chance of success in the mathematics and statistics majors than would larger universities such as the main campuses of CU or CSU.

In particular, it seems to me the department should be providing service to its community and to Western Colorado by training larger numbers of pre-service and in-service secondary mathematics teachers and through various other collaborations with local school districts that also involve in-service elementary teachers.

I have divided the remainder of my report into "Strengths" and "Recommendations." Readers will see that I have inserted some relatively short recommendations among the strengths. I hope I have also included much praise among both strengths and recommendations. Recommendations should be taken as ideas for improvement of an already very strong program.

Strengths

Commitment to teaching. I was very impressed by the energy and enthusiasm of the CMU mathematics faculty members I met and by their commitment to student-centered education. Certainly I was impressed by the ability of many faculty members to carry out top-notch research on top of heavy teaching and service loads; however, I was even more impressed by their obvious prioritization and love of teaching. Mathematics faculty necessarily work very hard at and are very skilled in helping weak to average, as well as good to excellent, students succeed in a notoriously difficult subject. My impression is that faculty I met attempt to meet all students in all courses "where they're at," but that smaller class sizes for general education and service courses would allow them to work

more closely and carefully with individual students to raise their levels of understanding, thinking, and execution.

As a group, if not individually, faculty provide a variety of classroom experiences, from group work to student presentations to traditional lecture. This is good: in order to reach all students and to set a good example for those students who will become mathematics teachers themselves, the mathematics faculty should model a wide variety of instructional styles and involve students actively in learning, both in and out of class. The overall quality of mathematics classroom instruction seems to be quite high, with most faculty striving to make teaching and learning as student-centered as possible. The faculty members I met were very committed to reaching and teaching students.

The mathematics faculty is fairly efficient in its division of labor but still very hardworking. The teaching load is substantial, with each faculty member teaching three courses and usually three preparations each semester, and sometimes supervising independent studies and/or student research projects as an overload. Faculty members hold office hours and presumably are available to students via email as well. Like mathematics faculty in many institutions, they rotate many courses among themselves, creating more course preparation for themselves than is absolutely necessary but also helping keep each faculty member intellectually involved with a wide range of mathematical disciplines and giving the department faculty as a whole, rather than individual faculty members, ownership of the department's courses and curriculum. Faculty also show their commitment to teaching by participating in workshops and conferences in order to learn and develop new teaching methods and strategies; by creating courses to meet the needs of other disciplines, such as biology, business, education, and engineering; and, most recently, by their willingness to take on campus-wide instruction in introductory statistics.

Efficient and effective advising. Course scheduling and advising of majors seems to be well organized and efficient. The sample four-year schedules, one for each of the three major tracks, provided at the program website, together with the tentative two-year schedule of courses at the university's website should be very helpful to students. I would improve upon this good idea as recommended below.

Appreciative students and graduates. Both the current students and recent graduates I met had high praise for the mathematics faculty, for individual courses, for particular concentrations, for advising, and for the welcoming atmosphere in the Mathematics Program and CSMS Department. The recent graduates all seemed to have terrific jobs (in business, statistics, software design, and teaching) and were very pleased with the preparation they had received for them in the program and department and, in some cases, the help the faculty had given them in obtaining those jobs. In at least two cases, having some computer science expertise in addition to mathematics and/or statistics helped them get the jobs they have now. The alums appreciated the faculty's "concern for students" and their help in "planning for our future [careers]," along with their "continuing friendships" with mathematics faculty members.

Students currently majoring in mathematics described mathematics faculty members as "challenging," "good teachers to emulate," "good explainers," and having a "passion for math," and appreciated being able to get help from faculty during office hours and indeed whenever their office doors were open. They also enjoyed tutoring opportunities, the opportunity to gain research experience via their senior projects, dedicated study

spaces such as the Math Projects Lab, and planning and participating in the annual "Math Extravaganza!" for local high school students. They and the alums enjoyed small upper division classes and agreed that studying mathematics (and computer science) at CMU was a "great experience."

Alignment with national standards. The Mathematical Association of America's Committee on the Undergraduate Program in Mathematics (CUPM) has just this year issued four "cognitive goals" and nine "content goals" for undergraduate mathematics majors and just this week issued its full *2015 CUPM Curriculum Guide to Majors in the Mathematical Sciences* [1]. This *Guide* is an update of its *Undergraduate Programs and Courses in the Mathematical Sciences: CUPM Curriculum Guide 2004* [2]. (See [3] for more information.) Although the 2015 goals [1, pp. 10-13] do not contain significant changes from CUPM's goals for undergraduate majors published in 2004, they remain ambitious. My impression is that the CMU mathematics program is meeting these goals as well as or better than most other departments and programs of its size, with particular strengths in

- focus on gradual development of students' logical thinking and proof skills,
- breadth of curriculum and selection of three major tracks or concentrations,
- depth in at least one mathematical discipline for most majors,
- computer science requirement for all majors and use of technology in some mathematics and statistics classes, and
- senior project requirement, including written and oral presentations, for most majors.

The program also meets the related goals of

- advising students effectively and
- providing a welcoming atmosphere and co-curricular activities.

The department's own goals and student learning outcomes, discussed further under the heading of "Assessment," below, align with the CUPM goals as well. I will discuss a few of the CUPM goals, having to do with applied mathematics and careers in mathematics, in the "Recommendations" section below.

The major tracks. While the majority of its course offerings consist of general education and service courses, the mathematics program also offers a fairly broad curriculum for its mathematics majors, exposing students in all three tracks to many areas of mathematics. Elective courses allow students in the general mathematics track to study applied mathematics, if they wish (as opposed to focusing only on theoretical or "pure" mathematics). Students in the statistics concentration are required to study both pure and applied mathematics. The general major track and the statistics major track, especially, allow students to acquire depth as well as breadth. Both current students and recent graduates in these two tracks appreciated what they saw as overlap between mathematics and computer science, allowing them to double major or minor in computer science.

The faculty's encouragement (in most cases, per program sheets) to take required computer programming and introductory statistics courses early in their mathematical careers allows students to take more courses in these fields, giving them even better preparation for jobs and careers.

All three major tracks in mathematics are designed to build students' skills and understanding – in particular, their ability to read and write proofs and to understand

abstract concepts – as carefully and gradually as possible. The Introduction to Advanced Mathematics (Math 240) course, in particular, is designed to help students make the transition from mathematical argument to mathematical proof. Suggestions for extending students' "transition to proofs" appear below as "Recommendations."

Secondary mathematics education majors take a sequence of courses that builds their mathematical skills and understanding as well as their knowledge of teaching. Those interested in teaching also have the opportunity to lead once-a-week recitation sections of College Algebra courses, an experience that, according to the students I met, can either reinforce their desire to teach or dissuade them from it!

Presumably, mathematics majors who follow the general track or even the statistics track may eventually become secondary mathematics teachers, and certainly may (and have) eventually become college or university instructors.

Commitment to improving success rates in College Algebra. Among the courses the program offers to satisfy general education requirements and the requirements of other disciplines, College Algebra appears to be the very largest. It also is the one in which the faculty has paid the most attention to improving success rates. I was especially impressed by the five-day version of the course and the "early start" options for the least well prepared students.

Commitment to campus-wide introductory statistics. As noted above, I also was impressed by the faculty's willingness to work with departments and programs campus-wide to coordinate and/or offer statistics instruction to their majors and graduate students.

The faculty. I've already commended the faculty's excellent and effective teaching and advising. The program is especially fortunate to have two statistics professors, Darren Gemoets and Rick Ott, who provide a very strong concentration in statistics, and two mathematics education specialists, Dan Schultz-Ela and Andrea Barnard, one a professor and the other an instructor (and possibly additional instructors), who provide mathematics instruction for future elementary school teachers. The program is also especially fortunate to have applied mathematician Lisa Driskell, along with a few other professors and instructors with interests in applications of mathematics. I mention these three disciplines (statistics, mathematics education, and applied mathematics) because they are currently the most sought after and it is often hard to hire new faculty in them. The other faculty members and their disciplines are wonderful; however, in many departments, "pure" mathematics faculty have to gain quite a lot of expertise in statistics and applied mathematics and in mathematics education in order to offer these specialties to their students because they have been unable to hire colleagues in these disciplines.

Having both a program- and a university-mentoring system, offered via pre-tenure committees, for new faculty is great.

Finally, the program self-study indicates a desire to have more tenure-track faculty to guarantee that tenure-track faculty teach lower division courses. This would be ideal, but I want to point out that having seven full-time instructors is much preferable to having scores more adjunct lecturers. The instructor I met was very impressive: a CMU graduate, he clearly loves teaching and curriculum development. He also has given presentations in the Mathematics Colloquium about his interests in applied mathematics (in which he has a masters degree). Instructors should be as fully integrated into the

department/program as possible, participating in faculty meetings, planning, course modification and development, and social events.

Assessment of student learning outcomes. The Mathematics Program has in place an assessment plan based on student learning outcomes which it has revised at least once. It has carried out assessments for two of five learning outcomes for the mathematics major and has collected data for two more. It has carried out assessments of two of five learning outcomes for the mathematics major with concentration in mathematics education and collected data for a third. I don't have a report for the mathematics major with concentration in statistics but I assume its student learning outcomes are at least partially shared with those of the other two concentrations. During my meeting with Director of Assessment Bette Schans, she realized that the reports I had were not the newest ones and gave me copies of just the two. (The "Student Learning Objectives" listed at the program website seem to be out of date.)

My understanding is that Prof. Shawn Robinson took over from Prof. Markus Reitenbach (who continues to help) in leading the assessment effort. More specifically, he is working with his colleagues on devising assessment tools, gathering data, and analyzing the data. The program seems to be off to a good start on this important and challenging task. Suggestions appear below under "Recommendations."

Scholarship and service. Despite their heavy teaching loads, mathematics faculty members engage in traditional research; research with students; other scholarly activities such as textbook translation and journal editing; service to the mathematical community; and service to the university. Their dedication to teaching and their committee work on campus are evidence of their commitment to the success of the university. They represent the university well off campus by their participation in journal editing (Cathy Bonan-Hamada and Phil Gustafson) and local and national workshops and conferences.

As for service to the CSMS Department and the Mathematics Program, each faculty member I met was involved in some way with department and/or program administration and many have given talks recently in the department's weekly colloquium series. The department appears to be ably, cheerfully, energetically, and efficiently led and run by Department Chair Lori Payne, again with various department members serving ably and willingly in various important supporting roles.

Classrooms, equipment, technology. The classrooms have received some recent upgrades (technology and whiteboards) and seem adequate; computer labs, hardware, and software seem a little less so. I support the requests made in the self-study and will include some of them in my "Recommendations" below.

Informal study spaces close to faculty offices. The Math Projects Lab, a small classroom equipped with computers, tables, and chairs – along with additional study spaces for mathematics students tucked into the "bays" of faculty offices and into the converted office space outside the Math Projects Lab, and all equipped with tables and chairs and the latter with a whiteboard – and are well worth the small investment. They help students make connections with faculty, form study groups with other students, create community, and increase student success. Create more of these areas!

Tomlinson Library. The program's new library liaison, Instruction and Reference Librarian Jay Ballenberger, seems eager to meet with – or at least communicate with – program faculty to learn what sorts of additional resources the library can provide. I recommend asking the library to order books written at the right level to support senior research projects. Library Director Sylvia Rael promises that the new library will be fabulous!

Co-curricular activities.

Math Club and Math Extravaganza! I was so impressed by the students' description of and obvious excitement about their Math Extravaganza! event for local high school students. Planning and carrying out such an event seems like an extremely valuable experience for Math Club members and should be an excellent recruiting device for the university.

Math Colloquium. The weekly departmental colloquium sounds both exciting and grueling (to organize, anyway). It's an excellent forum for faculty from mathematics and related disciplines to share their mathematical interests, for students (and faculty) to learn about cool and cutting-edge mathematics and applications of mathematics that they might want to turn into senior projects, for students to learn from alumni and others about exciting careers in mathematics and how to prepare for them, and for students to present their senior research projects.

Innovation Incubator (a.k.a. Entrepreneurial Zone): Students and faculty are excited about this opportunity!

Recommendations

Recommendations should be taken as suggestions to consider. The faculty have created a strong and vital program for all CMU students and, in particular, for mathematics majors. The faculty should make its own decisions about what would be most helpful to them and their students and for which, if any, of the following recommendations they should seek administrative support. Again, recommendations should be taken as ideas for improvement of an already very strong program.

The next tenure-track faculty hire should be ... a statistician or applied mathematician, or both. If the program adds statistics courses for the Business Department and for other disciplines, it will almost certainly need a third statistician; if students become more interested in the applied electives the program offers, whether or not they are grouped as a concentration, there may be a need for another expert in an applied field.

The administration should be prepared to make a multi-year commitment to these searches because it is usually difficult to hire faculty in these two high demand disciplines (and in mathematics education) and may take a few years. These three specialties are the "hot" fields right now. In fact, "applied mathematics" is a catch-all for several hot fields, including mathematical biology; mathematical modeling, especially in biology and environmental science; cryptography and coding theory; game theory; actuarial science and mathematics of finance; and more. These fields are especially amenable to undergraduate research projects and generally lead more directly to careers.

Support retraining of current faculty, including instructors, in statistics and/or applied mathematics. In the meantime or in addition, current faculty should be given time and

resources to gain as much expertise as they can in statistics and in areas of applied mathematics that interest them, and possibly also in mathematics education. This most likely would take the form of becoming more expert in instruction of courses in statistics and/or mathematical modeling, rather than expert at a research level in these fields.

For instance, training to teach introductory statistics using the data analysis based approach currently advocated by the American Statistical Association (ASA) and Mathematical Association of America (MAA) is available via the MAA's Professional Enhancement Programs (PREP): http://www.maa.org/programs/faculty-and-departments/prep-workshops/schedule/teaching-process-statistical-investigations-with-randomized-based-curriculum or [8]. Such a course is considered elementary in mathematics, but advanced in most other disciplines (e.g. biology, nursing, psychology and other social sciences, business, education).

Consider more seriously the program's request to hire another mathematics education professor to support mathematics curriculum for future elementary and secondary teachers. The Mathematics Program sees a need for another faculty member with a Ph.D. or Ed.D. in mathematics education, but this request does not seem to be supported by the number of students enrolled in courses for future elementary teachers and especially not by the number of future secondary mathematics teachers completing the Mathematics Education major. However, this faculty member may well be needed to help teach courses for future elementary school teachers and to develop one or more "theory into practice" courses for future secondary mathematics teachers. As noted above, the program is fortunate to have a professor and an instructor with specialization in mathematics education. However, in order to obtain the many grants available for mathematics education research, for pre-service and in-service teacher training projects, and/or for joint programs with school districts, it may be helpful and even essential to have a faculty member with a doctoral degree in mathematics education to serve as PI or co-PI on the project. My understanding is that the last such grant the program had was for a project with middle school teachers during 2007-2012.

Full-time vs. part-time, tenure-track vs. full-time instructors. The faculty would like to hire more full-time faculty and, among the full-time faculty, they would like more or all of them to be tenure-track faculty. Ideally, all courses would be taught by full-time faculty. More realistically, the number of full-time faculty should be large enough so that

1. courses in the calculus sequence and higher are taught by full-time faculty, with those calculus courses that lead to more advanced courses in mathematics taught by tenure-track faculty, and
2. each large multi-section course or cluster of courses (e.g. College Mathematics, College Algebra, the various calculus courses, introductory statistics courses) has a course director or coordinator, preferably a tenure-track faculty member, responsible for curriculum and perhaps also administration of the course(s).

I don't know enough about the variety of introductory statistics courses that are or may soon be offered to make a firm recommendation about their instructors, but I would urge that sections of Statistics 200 whose students are likely to go on to upper-division courses in statistics be taught by tenure-track faculty or at least full-time faculty.

Placement into mathematics courses. The administration should support the mathematics faculty's desire to place students into mathematics courses in which they

can succeed (with effort and persistence on the student's part, of course). Strongly encouraging and, if possible, mandating that students take the placement exam, if needed, and adhere to placement results would help students (and faculty) succeed. One small thing the program faculty should do is to rephrase their website wording about the purpose of the placement exam in terms of "readiness" or "knowledge" or "learned concepts and skills" instead of "ability" ("ability to succeed" would be OK, but the other words seem more encouraging to me). As for students placed by SAT/ACT scores, I assume someone also checks to make sure these students have actually taken the prerequisite mathematics courses.

General education and service courses.

Developmental mathematics: My understanding is that the CSMS Department no longer administers developmental mathematics courses. I am not at all an expert here, but I want to mention that California State University at Northridge (CSUN) has had recent success with its "Early Start" summer developmental mathematics program and with reconsideration of how developmental math is delivered to students who need it. My understanding is that much of this success has been due to designation of an energetic and thoughtful mathematics professor – who was, I believe, new at the time of this appointment – as half-time director of the program.

Math 113, College Algebra: This course should have a course coordinator who not only administers the course but also guides and develops the curriculum for it. In particular, the department should consider following national curriculum guidelines for College Algebra by integrating real world modeling and problem solving into the course, as outlined in the Mathematical Association of America's "College Algebra Guidelines" [7]. Environmental problems and modeling, for instance, would appeal to many students, would support the university-wide objective of "advanc[ing] the common good of Colorado and beyond," and is supported by recent textbook development. I was excited to read about the CMU Mathematics Program's participation during 2005-2007 in a nationwide program to test the effectiveness of a College Algebra course that featured mathematical modeling (with positive results), but disappointed to read that CMU did not continue to use this curriculum or a similar one.

Such a curriculum should make College Algebra more interesting and relevant, and certainly much less like the standard high school courses students may be repeating when they take College Algebra. The course coordinator should work with instructors, especially adjunct instructors (if any), to convert the course either very slowly or with a very complete text and supporting materials (or both).

When traditional courses like College Algebra are updated and taught "in context," instructors must be careful to make sure students know what they have learned from the standard curriculum, preferably soon after they learn it; that is, they must learn the standard names for concepts and techniques. This is to help them connect new ideas and understanding with previous learning, to recognize tools and methods when they see them in future courses (across the curriculum), and to reassure themselves and others that they are indeed learning the mathematical tools they will need for future courses and careers. I believe more "reform" textbooks now do this.

Mathematics majors, especially those planning to become secondary mathematics teachers, should continue to serve as teaching assistants for Math 113. They might have their duties expanded from leading recitation sections to assisting with in-class activities, running tutorial sessions, and grading papers.

Introductory statistics: The department should move toward the type of introductory statistics instruction currently recommended by the American Statistical Association (ASA) and Mathematical Association of America (MAA) in their "Joint Statement on Qualifications for Teaching an Introductory Statistics Course" [8]; namely, a course that focuses on data analysis. A statistics course that features collection and interpretation of real-world data sets (with the assistance of appropriate software) should be attractive to faculty and students of biology, kinesiology, nursing, business, social science, education – and mathematics and statistics. As it helps develop new introductory statistics courses for business and other disciplines, program faculty should have the opportunity to design such courses.

Other service courses: Program faculty should meet regularly with the programs and departments on campus it serves. More generally and ideally, program faculty should meet with other departments and programs on campus to see how they can support one another's curricula. However, given current staffing levels in mathematics and given that the outcome of such discussions may well be requests for the Mathematics program to offer more service courses for more departments, perhaps this is not such a wise idea!

Courses for majors and minors.

Extend the "transition to proofs" in the undergraduate mathematics majors: As noted above, all three major tracks in mathematics are designed to build students' skills and understanding – in particular, their ability to read and write proofs and to understand abstract concepts – as carefully and gradually as possible. The Introduction to Advanced Mathematics (Math 240) course, in particular, is designed to help students make the transition from mathematical argument to mathematical proof. The faculty already demonstrates its commitment to helping students make a smooth transition by requiring this course. The department could extend this transition by consciously considering the 300-level Linear Algebra course to provide a further introduction to proofs, if not officially designating it for this purpose. In fact, the 300-level geometry, number theory, and discrete structures courses taken by majors in the Mathematics Education concentration all should be considered part of this transition, even if not designated as such. The one-credit problem-solving classes and the seminar for first and second year students could also be part of this process. As the faculty well knows, most students would benefit from several courses worth of "transition" to higher order thinking skills!

Senior Seminar and Senior Projects in Mathematics and Statistics: As noted above, student research projects are strongly recommended by the leading national professional organization for undergraduate mathematics instructors, the Mathematical Association of America (MAA). The CMU Mathematics Program requires a culminating research project of every Mathematics and Mathematics with concentration in Statistics major. It supports and manages these projects in two two-unit courses, Senior Seminar I and II, with various faculty advising individual projects.

The faculty is wise to spread senior research projects over two semesters, to be completed during Senior Seminar I (2 units) and Senior Seminar II (2 units). Currently, the two courses are taught during fall and spring semester, respectively. However, the faculty is considering offering Senior Seminar II during both fall and spring semesters, so that students have a chance to begin this requirement by taking Senior Seminar I early, if need be, and complete it during the following spring or fall. This would have the further advantage of spreading faculty advising of projects between fall and spring (assuming the bulk of the work with students on their projects is done during Senior Seminar II).

In order to help make both the advising and facilitating loads more manageable as numbers of students increase, Senior Seminar instructors (and advisors) might:

- require students to begin their projects during Senior Seminar I, perhaps selecting their topics before the course begins or soon after;
- use (the beginnings of) the project itself for the practice in speaking and writing mathematics normally offered during Senior Seminar I;
- if procrastination has been a problem, set many small due dates; that is, trick students into getting the project done, the paper written, and the presentation prepared by helping them complete it in small pieces;
- encourage or require students to meet with their project advisors weekly;
- require a short paper and/or presentation on a particularly challenging, significant, or central part of their project fairly early, say end of Senior Seminar I or not too long after beginning of Senior Seminar II;
- allow weaker students to do expository projects on mathematics that may be at a lower level than you've been aiming for, but that will be challenge enough for them to understand and organize into a paper and presentation;
- allow students to explore late-blooming interests such as statistics or other areas of applied mathematics with their senior projects;
- continue to have faculty "advertise" their interests and even specific projects to students privately or in Mathematics Colloquium or in Senior Seminar I; and
- encourage faculty to devise rough ideas and outlines for projects, possibly related sets of projects, for seniors ahead of time.

The capstone experience for students majoring in Mathematics Education is surely student teaching, although projects and reflection papers completed in Mathematics Education courses might be better substitutes for the research project completed by the program's other majors. Novel or interesting middle school or high school curriculum development, perhaps completed in a new "theory into action" course, or even a research project in mathematics education based on statistical analysis could be presented in a poster or colloquium presentation (and a paper) just as the math research projects are.

Align the mathematics majors even more closely with national standards. As noted above, the Mathematical Association of America's Committee on the Undergraduate Program in Mathematics (CUPM) has very recently issued four "cognitive goals" and nine "content goals," which will form the basis of its revision [1], to be published later this year, of its *Undergraduate Programs and Courses in the Mathematical Sciences: CUPM Curriculum Guide 2004* [2]. (See [3], the website that hosts [1] and [2], for even more information.) Although the 2015 goals do not contain significant changes from CUPM's goals published in 2004, a fair number of them remain aspirational for many departments, including mine. As I said above, my impression is that the CMU mathematics program is meeting these goals as well as or better than most other departments of its size, with particular strengths in gradual improvement of students' reasoning skills, breadth of curriculum, student research projects, advising, and department atmosphere and co-curricular activities.

I suggested above and will suggest again some revision to the curriculum in order to aligning the program's courses more closely with MAA (and ASA) recommendations. While curriculum revision should be informed by recommendations from state and national organizations, it should be driven primarily by the Mathematics Program's

mission and resources. The program offers a wide variety of upper division courses for its majors, but not unreasonably wide. It appears to have done a good job of deciding which courses are most important and focusing on them. Students should have courses available in some key pure and applied areas of mathematics, and they do. At the same time, there should be at least one course that each full-time faculty member is really and truly excited to teach, but not necessarily in her/his field of training.

Applied mathematics: Assuming the department wishes to follow the MAA CUPM recommendations, one of the ones on which it (and many other departments nationwide) may need to work is "Content Recommendation 3: Mathematical sciences major programs should include concepts and methods from data analysis, computing, and mathematical modeling." Attention to this goal would also help guarantee satisfaction of "Content Recommendation 5: Students majoring in the mathematical sciences should experience mathematics from the perspective of another discipline."

It may seem odd and unfair to point out these two (or four) recommendations for improvement because many CMU mathematics majors already meet all but perhaps the data analysis goal. Mathematics majors take at least one computer programming course and presumably use appropriate software packages in some of their courses. They probably do some mathematical modeling in their calculus courses and perhaps in others. Furthermore, some of this mathematical modeling probably constitutes "experience[ing] mathematics from the perspective of another discipline." Finally, all CMU math majors take Math 200, a course in probability and statistics.

Data analysis: However, the first of the three parts of MAA CUPM "Content Recommendation 3" is specifically for "data analysis" – that is, for the same type of statistics course for mathematics majors that it and the American Statistical Association recommend for students in client disciplines (see "Introductory statistics," page 10) – in addition to the more theoretical probability and statistics sequence offered to math majors at the 300-level (with an introduction in Stats 200). Data analysis could be integrated into an existing course, perhaps Stats 200, or the program might consider adding a new 100- or 200-level data analysis course. The next questions are: Would the data analysis course count as an elective for mathematics majors? Would all mathematics majors be required to take a course in data analysis? If it has not already been done, making such a course an option for math majors would be a good place to start.

Mathematical modeling: Mathematical modeling is almost certainly present in calculus, differential equations, discrete structures, probability, and statistics courses, among others, and of course in the department's dedicated Mathematical Modeling course. The department offers special calculus courses for biology, business, and engineering majors. Faculty and students in these majors may have some interest in a course in mathematical modeling, especially one focused on applications in their majors. At my university, we have a very successful Introduction to Mathematical Modeling course, offered at a lower level than your course. Its prerequisite is Calculus I and, with some restrictions, it counts as an elective for the mathematics minor and major. Since the course was originally designed for environmental studies majors (and math majors and minors), its models at first focused on environmental issues. However, the course has gained popularity among biology and business majors and hence the models have expanded to biology and business, as well as to other topics. Given the wide variety of interests and abilities, the right instructor is essential to the success of this course. Such a course could integrate data analysis and should include appropriate software packages

and even programming languages and therefore could contribute to meeting all three parts of "Content Recommendation 3" and possibly also "Content Recommendation 5."

Such a course may be helpful in attracting math minors and even majors. At the University of Redlands, we have found the mathematical modeling course described above to be attractive and helpful to students, many of whom major or minor in mathematics. We allow our mathematics majors and minors to count as at most one of their three electives a choice of courses with fewer prerequisites than the usual math electives, including Introduction to Mathematical Modeling (prerequisite: Calculus I), Mathematics Consulting Laboratory (prerequisite: elementary statistics), and Game Theory (prerequisite: 200-level courses in at least one of mathematics or economics). (Their other two electives must be at a higher level.)

Applied mathematics, again: Again, the CMU Mathematics Program is doing a good job of ensuring that large numbers of math majors study statistics and computing, and of giving all of its majors the opportunity to study applied mathematics. The program might consider requiring at least one of the elective courses in the general mathematics major track to be selected from a list of applied mathematics courses (the program already offers at least five such courses, plus all the statistics courses). Also, the description of the general mathematics major track at the program website describes and stresses "pure" mathematics; be sure to promote applied mathematics opportunities within the major, too.

Applied Math major track?: I would say not yet. Rather, begin with these last two suggestions and with a sample schedule and/or paragraph suggesting elective courses that would give students an applied mathematics emphasis within the general major track.

Stand-alone Statistics major?: I would think not until the numbers of students in the existing concentration is higher. Would the program consider dropping Math 352, the theory of calculus course, from the Statistics concentration major requirements? Has this course been a deterrent or stumbling block, or are there others?

Preparing students for careers in mathematics. Another MAA CUPM content goal especially well aligned with CMU's mission and also with efforts by departments nationwide is "Content Recommendation 9: Mathematical sciences major programs should offer their students an orientation to careers in mathematics." Most mathematics programs have done a better job of informing students about such careers in recent years – and the CMU CSMS Department seems to have gone beyond information to actual placement in careers in computer science, statistics, and mathematics, judging by the recent graduates I met.

Organizations such as the MAA, American Mathematical Society, Association for Women in Mathematics, American Statistical Association, and Society for Industrial and Applied Mathematics have produced more information about more careers than ever before in recent years. However, many of the careers and opportunities featured in this material – in cryptography, actuarial science, finance, statistics, computer science, academia (see [4], for example) – are available only to our very best students. In many cases, these careers require specialized graduate work or, in the case of actuarial science, an examination process equivalent to graduate work. I'm concerned about our weak to average students. At my own institution, one of my department's immediate goals is to work with our Office of Professional Development (which offers career services for students) to develop opportunities for these less-than-stellar students and of course to help them prepare for these opportunities. I assume the CMU mathematics faculty has the

same concerns for its students, especially those who are not following the teaching or statistics tracks or completing a double major in computer science.

Besides continuing to carefully and thoroughly prepare statisticians and secondary mathematics teachers, the CMU Math Program should (or should continue to):

- make sure all students, even those not following the teaching track, know what steps to take to become secondary mathematics teachers, perhaps in programs that combine completing a teaching credential with earning a masters degree.;
- encourage students to take a computer programming course early and to continue to take computer science courses if they like and/or do well in the first one;
- give students experience in mathematical modeling and data analysis;
- make sure students are aware of the variety of masters degree programs available to them in mathematics, statistics, education, engineering, and more;
- in particular, make sure students know how to become a community college or university instructor, or even a professor of mathematics or math education;
- invite graduates (or other professionals), including the ones I met during my campus visit and some with humbler positions, to discuss (in person or digitally) with current students their careers and how-to prepare for them; and
- seek assistance from the CMU Career Services Center and from the Engineering Program's placement program (as Prof. Payne suggested) to help students find and obtain internships, jobs, and careers. Students suggested Career Services' outreach could be improved. Besides a faculty meeting with Career Services staff, a Career Services representative should speak in the Math Colloquium and/or the Senior Seminar about the services they offer to students. Some of the alums I met seemed eager to assist Career Services with mathematics, statistics, and computer science career counseling.

If enough students show interest in actuarial or financial mathematics, perhaps an actuarial or financial mathematics track could eventually be added to the major, or incorporated into an applied mathematics major. However, initially, the program should offer students guidance in selecting electives within the mathematics major (and in the economics and business departments) that would help them enter these fields. Passing the first actuarial exam before graduation would be very impressive and it is based on courses you already offer.

Make the secondary mathematics education track more attractive to majors.

I should say up front that I'm really mystified about this. Here are some ideas:

- Make sure that the program leads directly to jobs and that students know this.
- Make sure that students receive consistent advising and information from the mathematics program and education program. (Students reported a disconnect.)
- The sample schedule for this track at the program website seems to cram too many upper division mathematics courses into too few semesters. If the sample schedule, which begins with the Pre-calculus course in the first semester, is typical for these students, then something should be done to break up the logjam of too many wonderful, but challenging courses during the junior year.
- If there is any advantage (in addition to being able to spread out mathematics and other education courses better) to student-teaching during a fifth semester (after graduation), such as having the credits for it count toward a required fifth year or a masters degree, then make this an option.

- Make sure students in the other mathematics major tracks know what steps they can take to become secondary mathematics teachers, perhaps in programs that combine completing a teaching credential with earning a masters degree.
- Arrange for students to meet with, observe, and assist carefully chosen local middle school and high school math teachers so they gain a sense of the challenges and rewards of teaching. (I do know that such observation is already a big part of the Math Ed major program.)
- Arrange for students to tutor local students of all ages so they gain a sense of the challenges and rewards of teaching. At my university, the work-study or volunteer job of tutoring elementary through high school students at four local tutoring centers is a very popular one (it helps that we have a community service requirement). Our math majors also have the opportunity to tutor calculus students and other students in lower division mathematics courses.
- Familiarize students as well with the career of teaching mathematics in a community college or a four-year institution as an instructor or professor of mathematics or mathematics education. Emphasize especially the opportunities to teach at the university level after earning a PhD or EdD in mathematics education and, preferably, having some elementary or secondary teaching experience as well.
- I see that you have occasionally had teachers as speakers in your colloquium. Invite an especially charismatic one to talk about her/his career.
- In addition to assisting with College Algebra, assisting with the sequence of courses taken by future elementary teachers would be a good opportunity for future secondary mathematics teachers and for successful graduates of the courses themselves (future elementary teachers).
- Ask students why this program has not attracted larger numbers of students.

I wish I understood why this program isn't more popular. School districts in western Colorado should be hiring their math teachers from CMU. Ever since the recession hit, the secondary mathematics teaching credential programs at the California State Universities (CSUs), which were already large, have been booming with practical-minded, math-loving students seeking a rewarding career with some security. Whether it's the economic realities, the educational system, and/or the demand for teachers (much smaller population), something must be different in western Colorado.

Recruiting more mathematics (and STEM) majors. As I wrote at the very start, more CMU students should major in mathematics! The personal attention one receives from excellent instructors, the community of professors and students, and the challenge and reward of majoring in mathematics seem to be some of the best kept secrets on campus. Here are a few ideas for increasing the number of majors, in addition to those listed in the preceding section on recruiting future secondary mathematics teachers:

- Encourage the Admissions Office to recruit strong students, capable of and interested in majoring in mathematics or another STEM discipline.
- Ask Admissions to identify the best incoming students, regardless of intended major. Encourage these students to take Calculus I (or higher) early in order to keep the door open to mathematics, statistics, science, computer science, engineering, economics, and business majors and career opportunities.

- In particular, invite the high achieving students recruited under Provost Carol Futhey's current initiative (contact her for details) to consider mathematics as a major, a minor, or to support and strengthen work in another discipline. Even if not required for an intended major in another discipline, mathematics, statistics, and computer science courses will better prepare them for graduate programs and careers and make them more attractive to recruiters and employers. Make sure at least one mathematics faculty member is involved with this program.
- Current campus recruiting programs, such as the program for middle school students that was in progress the day I visited campus and the Math Extravaganza! program for high school students, should be continued and, if possible, expanded. The opportunity to plan and "perform" the latter, especially, may attract students to Math Club and as mathematics majors and minors.
- Consider visits by faculty and perhaps current students to local high schools, especially to AP Calculus and Statistics (and Computer Science) classes. At least one faculty member expressed great willingness to engage in such outreach.
- Provide information about careers in mathematics to both current and prospective students. For current students, especially, specific information about how to get from here to there would be helpful and attractive. A career placement program with a proven track record would be even more attractive. Continue to invite graduates and other professionals to discuss their careers in the weekly Colloquia series, perhaps increasing the percentage of presentations on careers. The alums with whom I met recommended a greater emphasis on careers. Some of them also offered to assist Career Services and/or the Math Program directly with mathematics, statistics, and computer science career counseling.
- For the statistics concentration, in particular, current students encourage you to advertise the benefits of the program better by providing more information about the opportunities to do real-world statistical studies and modeling in course projects and in the senior project, along with the great careers available for graduates.
- Current students did not agree about improvements to calculus and other introductory courses specifically to encourage students to go on to higher level math and stats courses. Suggestions included less memorization, more emphasis on mathematical reasoning and proofs, more real world applications to students' interests, and little or no online homework (they found the multi-step process, especially getting their answers in a form the system would accept to be cumbersome and frustrating – but one student did speak up for it, reporting that s/he appreciated the links to additional explanations of topics).
- Assign your best and most popular professors to teach Calculus I–III and Stats 200 or whichever courses you believe hold the most promise of attracting majors and minors.
- Continue to provide student-run tutorial sessions so students in introductory classes can experience the welcoming community and camaraderie of the mathematics majors early on – and to help them succeed in their classes.
- In as many classes as possible and in private meetings with students before each registration period, faculty should spend some time talking up the math and stats courses to be offered during the following semester and indicating, of course, which one(s) students should take next. They also should orient and advise

students on completing the minor and majors from their current course forward, e.g. "If you take just three more courses you'll have a mathematics minor and here are a couple of ways you could do that." They should have on hand (or on screen) sample four-year schedules from the current course forward, at least one for each of the three major tracks, and a tentative schedule of program offerings for the next few years. Such specialized schedules should be easily available to all mathematics students.

- Advertise the small upper division class sizes, personal attention from professors, availability of professors during office hours, opportunities to give and receive tutoring, opportunity to work on research projects with professors, Math Club, Math Extravaganza!, Math Projects Lab, great careers, and all the other benefits of majoring (or minoring) in mathematics, statistics, or mathematics education.

Advising mathematics majors. In addition to individual advising of mathematics majors, faculty should use a little class time each registration period for general advising about upcoming courses and to encourage students to meet with at least one of them for further advising, and/or hold general meetings for intended mathematics majors (with food as well as advice as incentives) to dispense information. The program sheets with their checklists of mathematics major requirements and sample schedules should be distributed to prospective and current mathematics majors whenever and wherever possible, including in class.

In addition to the program sheets, I would prepare and provide for students the following two items:

- a tentative schedule of sophomore and upper division mathematics offerings for the next three years by semester, days of week, and before 4 p.m. vs. after 4 p.m., if not with more exact times, and
- additional sample four-year plans, perhaps a total of three for each major track with different starting points (and perhaps a five-year or six-year plan, if applicable),

These should be available at the department website, at the department office, and in faculty offices. The more places they are available, the more likely students would be to consult them and, of course, they should be very helpful to students. Of course, the most effective advising consists of in-person individual meetings with students, even if they have to be coaxed to make and keep such appointments. I've found that the next most effective method of advising is to spend a small amount of class time discussing mathematics (and related) courses students might take during the following semester, along with some ways in which they could complete a mathematics minor or major from the current course forward.

Finally, it seems especially important for the large number of first-generation college students who attend CMU to have complete, accurate, and consistent information about the time and effort they will be expected to commit to their STEM classes. It would be even more helpful if as much assistance with study skills and time management, tutoring for specific courses, and direct financial assistance requiring fewer hours of paid work as possible were provided for these students.

Classrooms: All classrooms in which mathematics courses meet should be equipped with tables and chairs, rather than pocket desks or chairs with fold-up desktops, so that students can spread out notepaper, textbooks, calculators, and tablets or laptops and

easily work with neighbors in pairs or small groups. All mathematics classrooms should be equipped with as many whiteboards as possible and, again, with tables and chairs rather than pocket desks.

Technology is very useful in mathematics instruction, both in and out of class. The university should continue to expand and improve classroom technology by making any remaining classrooms "smart" and by providing adequate computer laboratories. The Mathematics Program should communicate its hardware and software needs to IT, which I'm told takes requests every semester. The program certainly should receive more frequent updates to such essential software packages as *Maple.* Also, 7 to 8 years is too many years to wait to upgrade faculty and classroom computers.

Study spaces. The program should keep the Math Projects Lab, the small classroom devoted to study and tutoring, as free as possible for those activities and, whenever and wherever possible, create more such spaces.

The CSMS Department is to be commended for creating small study spaces in the various bays of faculty offices. Faculty should be on the lookout for additional nooks and crannies (and even classrooms not in use at certain times of the day) that can serve as study spaces for students, and administrators should be creative and generous in meeting modest requests to furnish them with tables and chairs.

The wide hallway with the narrow "benches" (that aren't benches) along the walls could accommodate seating areas on at least one side that are at least one chair deep (from the wall) if not two, and perhaps even with rectangular tables that extend over the "benches" to the wall. I'm envisioning pairs of chairs (or pairs of pairs of chairs) facing each other all along one or both sides of the hallway, perhaps with tables (with lamps?!) between them and, even better, with carpet to delineate them from the hallway.

Online courses. Both administrators and instructors should appreciate the significant content – both ideas and techniques – of mathematics courses, the lengthy "sink time" most students need in order to understand these concepts and methods, and the large amount of tutorial assistance many (if not most) students require in order to succeed in mathematics courses. None of content, contact hours, office hours, tutorial hours, or length of "sink time" should be reduced in order to offer courses online. In particular, three-week online courses should not be offered for more than one unit of credit.

Support for undergraduate student tutors, graders, and teaching assistants. Monetary support (work-study, grants) should be continued and indeed increased for hiring student tutors, paper-graders, and teaching assistants to run recitation sections and to help with classroom activities and group work in lower division courses such as Math 113, College Algebra. Student assistants, especially those who are preparing for secondary teaching careers, could also run extra class sessions, recitation sections, or targeted tutorial sessions for other 100-level courses, with the goal of helping students become more successful in these classes.

Two of the full-time lecturers in my own department have almost convinced me that optional Monday afternoon homework sessions (like recitation or tutorial sessions, but faculty-led and therefore featuring lots of good hints and examples rather than problems done for the students!) are worth the time. We generally have two or more office hours every weekday with written homework due every class day (MWF) at 4 p.m. or so. This session would replace all or part of Monday's office hours and students could turn in homework at the end of the session or sometime afterwards. We also have student-run

calculus tutorial sessions Sunday through Thursday evenings 7:30 – 9:30 p.m. and daily tutorial hours as well for our many sections of Finite Mathematics (like Math 105 at CMU). Most of these student jobs are work-study jobs.

Some of us do use the web-based homework system WebWork (it's free), but for no more than one assignment per week. If homework grading becomes too big of a job for faculty members and student assistants, we use such strategies as grading only a few of many problems or giving short in-class quizzes to gauge understanding.

But my main message here is that opportunities for students to give and receive peer tutoring and mentoring in mathematics should be maintained and, if possible, expanded.

Assessment of student learning. As mentioned above, the Mathematics Program has in place an assessment plan based on student learning outcomes for at least two of its three major tracks and is carrying out assessments of its Student Learning Outcomes. The SLOs and the plan for assessing them look promising, and I found the (in-person) discussion by the recent and current leaders of the program's assessment effort, Markus Reitenbach and Shawn Robinson, respectively, and other faculty, to be realistic and thoughtful.

The department's Student Learning Outcomes are results any mathematics program would want for their students. But the real question at this point is, are these SLOs assessible and, if so, how?

Among the learning outcomes for the Mathematics Education concentration, Outcome #4, "Students will demonstrate familiarity with the logical and historical development of mathematics and the implications of this development," seems vague to me. Do you mean mean "implications of this development for mathematics education"? Do you mean, more specifically, "… will identify ways in which specific developments can be used in secondary mathematics instruction"? The plan to assess this SLO (and others) via portfolios seems promising.

Among the SLOs for the mathematics major, the first part of Outcome #4, "Students will learn an area of mathematics deeply and deliver substantial written and oral presentations of this area," may be difficult to assess without appealing to the senior project advisor's and facilitator's prior knowledge of the student. Certainly, learning an area of mathematics deeply is a laudable goal, but "Students will communicate mathematics clearly to peers, both orally and in writing," or a similarly stated outcome ("advanced mathematical concepts or methods" instead of just "mathematics," perhaps), may be more assessible. The Senior Seminar facilitator and the faculty advisor of the student's senior project could, after reading the final version of the student's senior thesis (senior project paper) fill out a rubric assessing written communication and all faculty attending the oral presentation could fill out a rubric assessing oral communication. (I know you have been using rubrics in this way, but I wonder if they could be simplified; see below.)

Generally, the verbs used in the SLOs – e.g. "construct," "prove," and "demonstrate" – bode well for assessibility. However, "understand" slipped into Outcome #2 for both majors and usually is difficult to assess. I would recommend dropping "and understand its limitations" or, barring that, changing it to a much more specific task, such as "record only significant digits" or "identify numerical results which contain uncertainty" – ugh! It would be tempting to make Outcome #4 "Students will demonstrate understanding of advanced mathematical concepts or methods by communicating them clearly to peers, both orally and in writing," but my experience has been that "demonstrating

understanding" would be difficult to assess using the evidence allowed in the current (nationwide) assessment climate.

Which reminds me: I want to assure the mathematics faculty that, although the current approach to assessment based on student learning outcomes and concrete evidence (with the goal of a "culture of evidence") may seem to faculty at public institutions to be just another in a long string of ever-changing expectations for assessment, to private school faculty they are the first serious attempt at assessment many of us have heard of – or at least the first seriously imposed on us by our accrediting agencies. For the first time, Congress, the public, and our accrediting agencies are now requiring evidence-based assessment from *every* tertiary institution, public and private. As a result, I suspect (and hope) this particular approach to assessment will be longer-lived than the previous renditions you've experienced.

Back to practical advice: As a possibly more realistic alternative to portfolios to assess proofwriting skills, in my department we saved final exams from Real Analysis and Abstract Algebra courses, both of which are required for math majors. Then, when it came time to assess this goal, we each fished out the exams for that year's senior math majors and picked one or two proofs to assess. We ended up assessing 4 or maybe 5 different proofs, with at least one, often two, for each math major. (We have fewer than 20 math majors per year and we always teach courses at least twice before passing them on.) Students were assessed using different exam questions asked by different instructors in different years (with lots of overlap), which we believe gave us helpful and valid results because we evaluated (aspects of) student proofs using only the tags "did not meet expectations," "met expectations," and "exceeded expectations." Sacrilegious as it may sound to mathematicians (but not to statisticians), you might consider evaluating student work in this way. (You could record and even analyze your numerical data as well.)

In case it helps, we've also been saving our Calculus III and Linear Algebra final exams and have used them to assess problem-solving and 'using both geometric and algebraic techniques or perspectives in problem-solving or analysis.' Again, when it comes time to assess these outcomes, we pick out the exams of students who actually ended up majoring in math. Our SLOs reflect our collectively held goals well enough that, so far, no one has had to say, "I didn't ask a final exam question that can be used to assess that SLO."

And, yes, we use rubrics to assess communication of mathematics, orally and in writing, for which we mark each of several desired outcomes "did not meet expectations," "met expectations," or "exceeded expectations."

Program faculty are correct to point out that administrators should not expect the program to draw conclusions or to make major changes based on sample sizes too small to have statistical significance.

Finally, it is frustrating to faculty everywhere to feel as if we have to cast aside some of our most important goals and objectives for students because they cannot be assessed and/or because they are largely aspirational. Universities and their departments should continue to state their goals and dreams for students, e.g. love of learning, confidence, along with their more assessible aims, e.g. writing and speaking clearly. At the same time, their objectives should include – and this may pertain to your general education and service courses – the very concrete and measurable aims of providing enough sections and seats in courses for students to take courses in sequence and graduate on time and of accommodating students in classes that are small enough to facilitate effective learning.

Can faculty teaching loads be streamlined? A common complaint among faculty everywhere is not having enough time to teach courses excitingly and innovatively, with adequate attention to students who are struggling as well as to those who would benefit from special challenges; to develop curriculum and write textbooks; to supervise student research; to conduct their own research; and to provide service to their universities, to their profession, and/or to the community.

Reduce preparations: In scheduling courses, the Department Chair should attempt to reduce the number of preparations for each faculty member – and especially for new faculty members – by, for instance, assigning two sections of a course to the same faculty member during the same semester or at least during successive semesters. Some senior CMU math faculty members made it clear to me that they prioritize day and time of course meetings over minimizing preparations. However, teaching loads for new faculty members should be minimized by reducing preparations and requests from any faculty members for a more streamlined load should be accommodated as well (but not usually extending quite so far as three sections of one course in a quarter!).

Minimize or give credit for independent studies: I also usually advise departments that directed studies should be minimized and, when offered, should be counted in faculty teaching loads. Directed studies in mathematics tend to be more time-intensive for faculty than in many other disciplines and often take as much time as would a fourth course. Two directed studies counting as one course seems fair to me, but, perhaps, as a starting point, six directed studies could count as one course. These credits could be "banked" until they add up to one course. If the program wishes to increase undergraduate research opportunities for its majors with course credit rather than stipends, in-term undergraduate student research by a group of students on a specific project or, if individual research projects are desired, on related projects, could be offered as a course to a group of students, preferably no more than six students.

Give credit for advising senior projects: As the number of senior math majors continues to grow, the amount of (uncompensated) time mathematics faculty spend advising these projects will grow, too. Faculty should receive course credit for advising these projects. Again, although some projects require as much or more time than a regular course, one course credit for each two senior projects advised seems fair to me. Faculty should devise a set of potential senior projects (or summer research projects) ahead of time, with the promise of course credit for actually advising them. These projects might be closely related to one another or reflect diverse interests. In addition to sharing their interests with seniors during the first half of the Senior Seminar (or during the weekly Colloquium), faculty could advertise their projects to seniors. It's wonderful to allow students to propose their own projects, but many will be happy for the guidance.

Encourage broad range of faculty scholarship. For promotion, a broad definition of scholarship should be applied, to include traditional mathematics research as well as teaching-related publications. This would help ensure that all faculty can relate their scholarship to their teaching and that teaching remains the faculty's primary mission. Participation in curriculum development should be regarded favorably for promotion, as should advising student research projects. Some of the challenges of publishing research done with undergraduates are discussed in [5] and [6].

In particular, I would encourage faculty to attempt to publish articles in the four refereed journals of the Mathematical Association of America (MAA), and I would urge the administration and department to reward such publication. These journals are largely

expository, but they have very low acceptance rates and reach large numbers of readers compared with more specialized journals. The same is true for the four refereed journals of the National Council of Teachers of Mathematics (NCTM).

Support travel to conferences: Finally, I would urge the administration to support travel to and the faculty to participate in more national (and even international) conferences to present their research and curriculum development projects. Projects with students, like those of Prof. Kavanagh (whom I did not meet) during the ten years he participated in the Colorado Space Grant Project, should be shared more widely.

Administration and faculty governance. I was somewhat surprised by the relatively lean and efficient administrative structure at CMU: combined Provost and VPAA, assistant VPAAs, no deans, and chairs of "departments" consisting of rather large clusters of "programs." I was pleasantly surprised because one more often sees administrative structures that don't seem to be lean at all, but also slightly concerned by a few aspects of the system. To be fair, I should say "impressions" of the system rather than "aspects" because one day was hardly enough time to draw definite conclusions. One impression was what appeared to be the linearity of the system; in a very friendly place where everyone knows everyone else and administrators are literally steps away from faculty, it seemed as if information flowed only along the "chain of command." In contrast, I have always seen my dean (and I've had several) as an important resource to be consulted directly from time to time and faculty governance committees (curriculum, personnel policies, tenure review, budget, etc.) always include an *ex officio* administrator in addition to the many voting faculty members. Which brings up another point: At my university, we have a very strong system of shared governance between faculty and administrators, which I believe promotes a feeling of community and commitment to the success of the university. CMU doesn't seem to have such as system (but of course I may simply be ignorant of its existence).

My own department has found great value in my insistence that all faculty rotate through the chair position so that everyone appreciates what's involved in running the department. But there's also great value in having an extremely competent chair, as the CSMS Department has in Professor Payne, leading the department. Perhaps a good compromise (campus-wide) would be to have (rotating) program directors serving under the department chairs and/or to assign more official roles to faculty within programs, e.g. course coordinator (for a particular course), curriculum coordinator (course scheduler), colloquium director, concentration director, Math Club advisor, etc. A related concern is that faculty at my institution who are interested in administrative careers have plenty of opportunity to get involved in faculty governance (serving on and chairing a range of important committees, serving as chair of a faculty assembly or senate) and in administration (chairing their own department and serving as an assistant or associate or even interim dean) before moving upward and onward. There doesn't seem to be nearly as much opportunity for this experience at your larger institution.

Conclusion

The CMU Mathematics program does an excellent job of educating undergraduate mathematics majors in its three major tracks, and a very good job of educating the CMU students in its many general education and service courses. I very much enjoyed my visit

to campus and I especially appreciated the "can-do" spirit of the students, faculty, and administrators I met. Thank you for the opportunity to participate in your review process.

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