

WEBER STATE UNIVERSITY

PROGRAM REVIEW EXECUTIVE SUMMARY

**DEPARTMENT OF MATHEMATICS**

December, 2020

## **1. INTRODUCTION**

Two departments are responsible for mathematics instruction at Weber State University. The Developmental Mathematics Program (Dev Math) oversees the courses Intermediate Algebra (Math 1010) and below. Only Math 1010 gives credit toward a student's degree.

The Mathematics Department oversees the courses of Math 1030 and above. Although the division of teaching duties started at the beginning of Summer 2007, the two programs work together at the interface and share some resources. Each of the instructors (or lecturers) in the Dev Math Program teaches one course a semester for Math as part of their contractual duties. The current Program Review is of the Mathematics Programs within the Mathematics Department.

One of the focuses of the department is retention and timely graduation. Since the last program review in 2017/2018, the Math Department graduated a total of 67 students awarding a bachelor's degree and 118 associate's degrees (the data includes Fall 2020). Our graduates find employment in middle or high schools, in the industry, and are accepted to graduate programs. Over one year, from Fall 2019 to Fall 2020, the department served 7,593 students enrolled in math or math education courses (Math 1030 and above). Half of those students, namely 52%, were students enrolled in QL courses. Over the same period (Fall 2019 to Fall 2020), we generated 26,628 student credit hours (SCH), with 55% in QL courses (Math 1030, 1040, 1050, 1080, 1810).

## **2. Standard A - MISSION STATEMENT**

The Mathematics Department mission is to help students develop the knowledge and problem solving skills necessary to competently integrate mathematics into their personal and professional lives. Faculty endeavor to create an environment that makes that possible. Quality teaching of all departmental courses and the supervision of student projects including undergraduate research are central objectives.

The Mathematics Department is committed to providing excellent opportunities for all students: students majoring in pure or applied mathematics or computational statistics and data science, students majoring in science or engineering fields that depend heavily on mathematics, future teachers, in-service teachers, and all students seeking to improve their quantitative literacy. The department offers curricula that attend to the needs of the diverse educational and career goals of our students. Since mathematics is relevant to numerous fields, many of our course offerings are designed in a manner sensitive to other disciplines. A common emphasis in all our courses is the process of mathematical thinking and problem solving, as these skills will serve all students during college and for years to come.

Mathematics, computational statistics and data science, and mathematics education are growing and developing fields. We believe that faculty who are actively involved in scholarship and professional development tend to be highly effective teachers, and thus we value mathematical and educational scholarship, in-service teacher training, and course and curriculum development. Professional and scholarly work is both expected and encouraged.

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### **3. Standard B - CURRICULUM**

As it is stated in our mission statement: *The department offers curricula that attend to the needs of the diverse educational and career goals of our students. Since mathematics is relevant to numerous fields, many of our course offerings are designed in a manner sensitive to other disciplines. A common emphasis in all our courses is the process of mathematical thinking and problem solving, as these skills will serve all students during college and for years to come.*

The Department of Mathematics offers a variety of courses from general interest to advanced levels of applicability. Our students can earn a Bachelor of Science or Bachelor of Art in Mathematics, Mathematics Teaching, or Applied Math. We offer computing emphasis, engineering, actuarial/financial emphasis, natural/life sciences, and physical mathematics for the applied math degree. The department also offers a Bachelor of Science in Applied Statistics and Data Science, and Associate in Mathematics. We have three minors and departmental honors.

Some of the required upper-division courses are offered once a year. Other courses are offered at least every other year. Core courses, like Calculus sequence, Elementary Linear Algebra (Math 2270), and Differential Equations (Math 2280), are offered every semester, including the summer. Those courses are required for other majors, like chemistry, computer science, engineering, math, or physics.

If a student needs an upper-level course to graduate before the course is offered in our regular rotation, we may offer the course as a reading course so that the student's graduation is not delayed. Offering upper-division courses more often is desirable and would happen if there were more faculty and more majors.

Our math programs and courses are very similar to others across the US. The courses for each math program have been the result of a thoughtful and ongoing process. We frequently review programs around the country for new ideas and see that the current curriculum is relevant and close to what other quality institutions offer. We also work with other departments to provide courses that meet their needs.

### **4. Standard C - STUDENT LEARNING OUTCOMES AND ASSESMENT**

The following describes the current state of assessment for the programs in the Mathematics Department. The department forms goals, a curriculum grid for those goals, and an assessment plan based on the department mission. The goals are reviewed periodically and used to establish program learning outcomes for each of the department's majors and measurable course learning outcomes for each of the required courses.

The following goals have been established for each of our majors:

- All mathematics majors should learn a fundamental set of skills that will enable them to succeed in today's changing world.
  - Problem Solving & Independent Learning: They should be adequately trained to apply their mathematical knowledge in both familiar and new situations. They should also be able to seek new knowledge to help in those endeavors.

- Technology: They should learn to use appropriate technology, such as computers, as an aide in investigating mathematical problems and teaching.
- Communication: They should learn to successfully communicate mathematical ideas and solutions of problems with others at the appropriate level.
- Mathematics majors should gain a substantive knowledge and comprehension of the major ideas in the core areas of their fields of study.
  - Mathematics: The main topics are modern and linear algebra and analysis of real-valued functions.
  - Applied Mathematics: The main topics are numerical and statistical analysis, linear algebra, mathematical modeling and differential equations.
  - Mathematics Teaching: The main mathematical topics are the ones contained in mathematics courses required for certification. Mathematics teaching majors should also learn effective approaches for teaching mathematics.
  - Computational Statistics and Data Science Major: The main topics are computational statistics and data analysis.
- Students pursuing Mathematics Minors, Mathematics Teaching Minors, or Elementary Mathematics Endorsements should be able to effectively apply appropriate mathematical ideas and/or teaching approaches in their field.
- Mathematics service courses should meet the overall varied needs of client departments. Students in these courses should obtain the required mathematical knowledge.

Assessment is an ongoing process in the Mathematics Department. Externally, broad reviews are conducted regularly by the Board of Regents and by Northwest, ABET, and NCATE accrediting agencies. These generally include reviews of departmental offerings, course content, textbooks, and examinations. Usually, experienced professionals compare our programs with others and provide the department with reports where math programs' strengths and weaknesses are identified. Other programs also undergo similar external reviews. Based on all these reviews and in consultation with other departments, the Mathematics Department makes necessary changes to improve its courses.

Internally, the Mathematics Department reviews its entire curriculum periodically, has dialogs with departments that we provide service courses, re-evaluates textbooks annually, keeps current on national curriculum trends, and studies course grade distributions from time to time. Our graduating students are assessed mainly by their course grades. The current assessment results are presented in Appendix G. We also conduct graduate exit surveys from all graduates as a part of the graduation sign-off of majors and minors. These surveys show that the department is doing a good job preparing our majors for future success.

### **General Education:**

The Department of Mathematics supports General Education Programs at Weber State University by offering Quantitative Literacy courses: Math 1030 QL Contemporary Math (3 credits), Math 1040 QL Introduction to Statistics (3credits), Math 1050 QL College Algebra (4 credits), Math 1080 QL PreCalculus (5 credits) Several sections of each course are regularly offered each semester. We offer courses in different formats (face-to-face and online) using various teaching methodologies (lecture style, problem-solving approach, flipped class). Three new quantitative literacy courses are currently in the process of approval: Math 1035 QL Contemporary Math with Pre-requisite Topics (6 credits), Math 1090 QL Business Algebra (3 credits), Math

1120 QL Foundation of Data Science (3 credits). The math faculty also developed and offered innovative cross-disciplinary courses, WSU courses: WSU 2350 Writing with Numbers HU/QL (4credits), WSU 2340 Math and Dance or Pattern Play: Move/Math CA/QL (5 credits).

### **Other Campuses:**

The department has been working with the Division of Continuing Education to offer evening classes and courses on other campuses: Davis campus, Farmington, and West Center (Roy). We offer daytime and evening courses at Davis and Roy campuses, but in Farmington, only evening classes. Most of the courses are QL courses, but we see a growing interest in calculus courses offered in the evening at the Davis campus. The growing interest in calculus classes at Davis is probably because of the location of Hill Air Force Base. In the 2019-2020 academic year, we offered 13 sections at Davis, 3 sections in Roy (Math 1030, 1050), and one section in Farmington (Math 1050). In Davis, we offered: Math 1030 Contemporary Mathematics, Math 1040 Introduction to Statistics, Math 1050 College Algebra, Math 1080 Pre-Calculus, Math 1210 Calculus I, Math 1220 Calculus II.

### **Concurrent Enrollment:**

The department, in partnership with Continuing Education, offers concurrent enrollment courses. Currently, we are serving four school districts: Davis, Morgan, Ogden, and Weber. We also work with four charter schools and one private school. The enrollment in concurrent enrollment courses has doubled since we started this program. In 2019-2020 we had 20 schools offering CE math classes and 46 teachers teaching concurrent enrollment math classes. In the 2019-2020 academic year, we had more than 2000 students enrolled in Math 1030 CE Contemporary Math and Math 1050 CE College Algebra.

## **5. Standard D - ACADEMIC ADVISING**

The department's chair and assistant chair are the leading academic advisors for all mathematics majors and minors. Some students receive advising in small groups during new student orientation. However, most advising occurs in a one-on-one manner. In a typical advising session, the discussion primarily centers on course sequencing and course emphases (such as how to be as prepared as possible for certain challenging courses). Often, the advisor prepares a tentative course plan for the student's next few semesters or years. This tentative plan is made with an eye toward the past academic performance of the student. In particular, the intent is for the plan to be realistic for the individual student in question. In some cases, students are either exploring the possibility of being mathematics majors or are trying to decide which mathematics major (e.g. applied mathematics) is the best fit for them. In these cases, a substantial amount of time is spent discussing issues ranging from mathematical content to careers, and students are often given information from sources such as MAA publications related to careers in mathematics.

## **6. Standard E - FACULTY**

The department has 18 faculty (one of them is an instructor), which constitute 17.25 FTE since one faculty member is  $\frac{3}{4}$  time and one math education faculty is assigned half time in the CSME (Center for Science and Mathematics Education). Each of the Developmental Math instructors (about 12) teaches one QL course a semester. Currently, the department employs about 13 adjunct instructors. The course work of adjunct faculty is equivalent to 10 regular faculty. Over the last 5 years, Math has employed 28 different people as adjunct instructors (developmental math employs many more). A group of regular adjuncts teaches at least one course per semester, and several are teaching 2 or more. Depending on qualifications, adjuncts mostly teach QL courses and sometimes Calculus I.

The Math Department is in desperate need of a Statistician and/or Data Scientists to support the growing demand for statistics courses and to grow Computational Statistics and Data Science Program. Our faculty are constantly asked to assist faculty from other colleges with analyzing data needed for faculty research. A Statistician is so needed for this university to grow programs, provide quality instructions, and satisfy the needs of today's world regarding data science.

The department also needs an Applied Math faculty to support growing engineering programs. About five years ago, the College of Engineering, Applied Science and Technology (EAST) started new engineering programs: mechanical engineering and electrical engineering. Mathematics plays a significant role in engineering. The Math Department did not receive any support from the administration in satisfying the demand for a growing number of math courses required by the engineering programs. Since the engineering program started, we had to add sections in Calculus I, Calculus II, Calculus III, Linear Algebra, Differential Equations, and Calculus base Probability and Statistics. The department can barely keep up with the demand for those courses. In Section 6 of the program review, we provide data on the enrollment of those courses.

For ongoing review and development, the chair meets with each faculty member once a year as part of an annual faculty review. Tenure track people are subject to additional reviews for tenure. The reviews show that faculty are doing a very good job teaching and that standards are appropriate. Styles and methods differ, but all are motivated to do their best. The Department of Mathematics offers its students many different high-impact educational practices. For example, group work, presentation, writing a paper, or solving problems from mathematical journals. Several students submitted their solutions to the College Mathematics Journal or Mathematical Magazine. Our students participated in Math Jeopardy or Integration Bee at the regional MAA meetings (Mathematical Association of America). A group of our students was recognized at an international Mathematical Contest in Modeling, receiving an honorable mention among teams from 900 institutions around the world.

## **7. Standard F – PROGRAM SUPPORT**

### **Support Staff, Administration, Facilities, Equipment, and Library**

The Mathematics Department has only one Administrative Specialist who is serving the department and takes care of students' needs. The position requires more work than other departments because every student must meet the QL requirement. The amount of work required from our admin is significantly above what is needed in other departments. Section 7.1 provides data comparing the Math Department to the Developmental Math Program with two staff members.

The university community and the department would benefit tremendously from an additional staff member dedicated to working with students and helping students navigate QL courses. In Section 7.1 of the program review, we propose a solution with reconfiguring our current staff and possibly add a member.

The Mathematics Department has adequate office equipment and computers because the department is now residing in a new and improved building, Tracy Hall, using up to date offices and classrooms. The administration well supported the department during the pandemic. Efforts were made to reduce class sizes, so it is more manageable in an online/virtual environment. We are very grateful for this support.

## **8. Standard G - RELATIONSHIPS WITH EXTERNAL COMMUNITIES**

Over the past few years, the department has steadily improved its relationships and interactions with the school districts within the Weber State University service area. Faculty from the Math Department works with local school districts on grants providing professional development workshops for K-12 teachers, and teach evening classes for teachers pursuing elementary mathematics and STEM teaching certificates.

For the last three years, the Math Department hosted the Utah State math contest for junior and senior high school students. The faculty prepared test questions for both tests, provided solutions, and helped organized the contests. In 2018, there were 1300 participants from districts all over the state and 1600 participants each year in 2019 and 2020.

Relationships with industry and government are more informal. We have formed an advisory board to get advice and feedback about our programs. They keep us informed about how our students are fair in the workplace and let us know their companies' upcoming needs. Several of our adjunct instructors have quit due to finding local employment. Many of our students are employed locally.

## **9. Standard H - PROGRAM SUMMARY**

The programs offered by the Mathematics Department have quality, consistency, qualified faculty, and are meeting student's needs. The Mathematics Department has been responsive to prior reviews. Improvements are resulting from careful planning and analysis of the mission statement, student learning outcomes, curriculum, teaching and learning efforts, and academic ad