2017-2018 WSU Five-Year Program Review
Self-Study

Cover Page

Department/Program: MATHEMATICS

Semester Submitted: FALL 2017

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Self-Study Team Members:

including courses for teachers instructing concurrent enrollment courses and courses that help local school teachers, elementary and secondary maintain math endorsements.

There is one Administrative Assistant and an occasional student hourly worker, about 5 hours per week.

Course requirements for the Associate's and Bachelor's Degrees are listed in Appendix 2. The files were taken from the 2017-2018 WSU catalog.

<u>Curriculum Maps</u>

	Department/Program Learning Outcomes		
<u>Weber State University Applied Mathematics Major</u> (There are six different tracks) Core Courses in Department/Program	Knowledge of and the ability to apply the concepts of differentiable, integral, and multivariable calculus.	Knowledge of and ability to apply the concepts of matrices and Euclidean vector spaces, and ordinary differential equations.	Knowledge and ability to apply the concepts of several areas of applied -0. -1.2h-.001 T ( )TJ0ryysrJ-0.002 w 0.109

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Weber State University Applied Mathematics Major (There are six different tracks) Core Courses in Department/Program	Department/Program Learning Outcomes			
	Knowledge of and the ability to apply the concepts of differentiable, integral, and multivariable calculus.	Knowledge of and ability to apply the concepts of matrices and Euclidean vector spaces, and ordinary differential equations.	Knowledge and ability to apply the concepts of several areas of applied mathematics (probability and statistics, numerical analysis, partial differential equations, etc.).	Ability to comprehend and write correct mathematical arguments.
MATH 3710 Boundary Value Problems	M	H	H	M
MATH 3810 Complex Variables	H	L	M	M
MATH 4610/4620 Numerical Analysis I & II	M			

Weber State University Math Teaching Major Core Courses in Department/Program	Program Learning Outcomes				
	Knowledge of and the ability to apply the concepts of differentiable, integral, and multivariable calculus.	Knowledge of and ability to apply the concepts of matrices and Euclidean vector spaces, and ordinary differential equations.	Ability to comprehend and write proofs that are logically, grammatically, and mathematically correct.	Knowledge of basic probability and statistics, analysis, and number theory.	Knowledge of and ability to teach concepts of high school level mathematics.
MATH 2270 Elementary Linear Algebra	M	H	M	L	L
MATH 2280 Ordinary Differential Equations	H	H			

Standard C -

Five-year Assessment Summary
A summary of assessment findings and actions since last program review. Annual assessment reports for each year can be found at http://weber.edu/oie/department_results.html.

The department has been compiling and summarizing course data for a very long time. During the last five years all the pass rates (includes W's, UW's, I's, NC's, AU's as not passing) have generally been 70% or above. This is also true for previous years. There were very few times that the rates were below 70%.

Five years ago we formulated particular learning outcomes for each course. The general education QL learning outcomes were adopted for QL courses, MATH 1030, 1040, 1050, 1080. Note that Trigonometry, MATH 1060 is not a QL course.   Grades on homework assignments or questions on a test were used as direct measures for student attainment of each outcome. See our assessment plan that can be accessed via the link above for details. The data collection has been difficult and sporadic for the courses up to calculus because there are so many adjuncts for these courses. Nevertheless, we made efforts to have all instructors add a common set of questions to their final exams and then report the results.   Results were mixed. But after discussions on improvement and changes all thresholds were met and for three semesters in a row.   After that sampling a few courses started. We intend to do all courses spring 2018 since the courses are scheduled to be renewed in fall of 2018.

Summary for 2012-2013
Spring of 2013 was the third semester that the course learning outcome assessments were done for QL courses. Math 1040 was not done in the spring of 2013 since all the thresholds we2 (h)-6i that saml -0.002 yi(l -0

Assessment of Real Analysis 1 and 2 were done. All the objectives were met.

Summary of 2015-2016
The QL courses were not assessed during 2015-2016 since they had previously been assessed and meet the objectives for several semesters. A sampling of sections of Trigonometry (not a QL course), Calculus 1,2 and 3, linear algebra, differential equations were reassessed. All objectives were meet. Most of the program courses that had not undergone assessment previously were assessed. Some were repeats. Most courses meet their objectives. There was one that was within 1 percentage point of meeting the objective. There was another for which the instructor was directed to assess the direct measures but did not report any results (it is really difficult to get faculty to do this stuff).
Additional Results
a. Assessment- Graduates indicated that some required courses were not offered often enough. Action- Upper level courses will be scheduled more often as faculty are available. New faculty/instructor positions continue to be requested.
b. Assessment- Non STEM majors are having difficulty meeting the QL requirement due to the prerequisite course Intermediate Algebra. Action- The prerequisite course for Math 1030 and 1040 was lowered to include a Math Numeracy offered in Developmental Math.
c. Advisor board indicated that a Math Graduate with computer skills was more employable. Action- Math majors now have the option to complete a selection of programing courses instead of fulfilling a Minor.
d. Assessment- Students wanting an Associate's Degree but also interested in eventually obtaining a Math degree were not enrolling in Calculus until their 2nd or 3rd year. Action- An Associate's degree in Math was approved in 2015-2016.

Summary of 2016-2017
Only a very few of the sections of QL courses MATH 1030, 1040, 1050, 1080 assessed learning outcomes via questions on the final exams. Most of the thresholds were meet, but since the number of sections was so small the results do not seem meaningful. The results will be shared with department faculty and discussed in the spring semester. The spreadsheet with details is in Appendix 1.

Actions in the last five years and future plans:
      Faculty discussions took place in committee and department meetings,
      Some faculty are offering weekly recitation discussion/problem solving sessions,
      Calculus one and two now have common finals and test grading parties,
      We are considering common finals for College Algebra,
      One faculty has instructed a course for math tutors employed in the tutor lab "The Solution Space",
      We are planning a course for math tutors

Future Learning Outcome Assessment Plan

Mathematics is the most objective academic area. At the undergraduate level courses contain a large number of concepts and skills and problem solving using that knowledge and those skills. As a result there are usually hundreds of learning outcomes that students should attain. On the one hand we could list all and try to compile the data but that would entail so much effort and time we could not get funding to do it. On the other hand every homework assignment, quiz, and test question is a direct measure and subsequently scores on tests are direct measures. The most meaningful of these measures are scores on comprehensive final exams. The department is considering reporting a combined percentage score for each course based on quizzes and tests for courses Calculus and above.

<u>Advising Strategy and Process</u>

The chair and assistant chair of the department are the main academic advisors for all mathematics majors and minors.   In addition each major is assigned a faculty advisor particular to the student's career goal. Some students receive initial advising during new student orientations. Other students will call, come in, or make an appointment to talk to the chair. They are given information about the math programs and potential careers. They are declared as majors or minors in the university electronic records and they are given help planning a schedule. Students are encouraged to contact the chair when they need more advice or help planning a schedule. Some students desire a personal year by year schedule. In this case one is planned. Other questions are answered as they arise. In addition we are doing the following:

      Encouraging majors to see and adviser each year via emails and posters,

      We post and update grad maps which are generic semester by semester course schedules (grad maps can be found at https://apps.weber.edu/gradmaps/ ,

      We have handouts that list the course requirements for each major, minor, and associate's degree,

      The Math club hosts a yearly meet your adviser event,

      We have many flyers about careers and opportunities,

      We occasionally have presentations by employers or alumni.

Future elementary school teachers that want to specialize in mathematics are advised by our math education faculty on an as needed basis. These students also receive advice from the College of Education.

Advising students on QL is spread across the university:

      Each college has one or two advisors responsible for their programs and general education,

      The student success center has advisors,

      There is a lot of information on web pages,

      There are a lot of ads about QL ,

      The chair and occasionally faculty also give advice.

The Developmental Mathematics Program does the advising of students in developmental courses.

<u>Effectiveness of Advising</u>

Graduates complete an exit survey. The results indicate we are doing a pretty good job, a rating of 6 on a 1 to 7 scale. We encourage students to keep in contact with us and many do. Most graduates are finding employment or attending grad schools.

<u>Past Changes and Future Recommendations</u>

Almost all the items listed in the first paragraph of this section were initiated during the last five years. Current and future plans include:

      Recruiting alumni to make presentations for math majors,

      Encouraging majors to consult MAA materials and journals via their free membership,

      Encouraging students to join LinkedIn.

Standard E - Faculty

Faculty Demographic and Diversity Summary (Appendix B contains details)
The Department has 16 faculty which constitute 14.75 FTE since one member is ¾ time and two math education faculty are assigned half time in the CSME.

Demographic Summary
Gender: 4 female, 12 male
Rank: 5 Professors, 7 Associate Professors, 4 Assistant Professors
Tenure: 12 tenured, 4 tenure track
Highest Degrees: all have doctorates
Areas of Expertise: algebra, real analysis, combinatorics, linear algebra, differential equations, differential geometry, geometry, math education, matrix theory, statistics

Programmatic/Departmental Teaching Standards
The department maintains a high level of academic integrity in programs and courses. To pass a course a student must receive a C.

For lower level courses department faculty generally follow and Adjunct Faculty and Dev Math instructors are required to have the policies:
    Students are not allowed to use text books, formula sheets, or notes on tests,
    Three or four midterm exams and a final exam are to be given,
    A standard grading scale is to be used,
    At most a scientific calculator may be used on exams with the exception of Math 1030,
Contemporary Math and Math 1040, Introduction to Statistics where a graphing calculator is allowed,
    There are common final exams and grading parties for calculus one and two.

For upper division courses (>3000) faculty generally do the following:
    There are midterms and final exams,
    Take home exams are discouraged except when there are very time consuming calculations,
    Certain courses have papers, projects, or presentations, e.g. Modeling, Numerical Analysis, math education courses.

Elementary education majors are required to pass a set of three courses specifically designed for their degree. They also must get a score of at least 80% on a timed fluency exam on basic arithmetic calculations without a calculator.

    Faculty Qualifications
Faculty CV's are available in an online folder by requesting access.

Be sure to include this (completed) summary graphic:

Faculty (current academic y ear) in Math Department, highest degree

Number of faculty with Doctoral degrees	16	0	0
Number of faculty with Master's degrees	0	0	3
Number of faculty with Bachelor's degrees	0	0	18

IT support is mostly adequate.

Adequacy of Facilities and Equipment
We moved into a new building May of 2016.   Adequacy:
	The new faculty offices and furniture are great,
	Faculty receive a new computer every 5 years,
	The work room is very small, storage could be more functional, counter space is limited.

The new classrooms and furniture are mostly adequate:
	There are only 9 classrooms assigned to math, a few others may be available,
	One of these is an excellent elementary math education teaching lab with an attached store room,
	Many courses are full with 10 or more students on wait lists, but no rooms and are available,
	The "Wall Talker" boards are extremely difficult to erase and are easily damaged,
	IT is moderately adequate, but document readers are difficult to adjust and "Smart Boards" do not
seem to be operational.

The college has a computer lab with 20 desk top computers and math has a set of 24 laptops for
classroom use. These are mostly adequate.

Adequacy of budgets
Operational budgets are mostly sufficient.
Instructional wage budgets (for adjuncts and overload pay) have been sufficient and more is available,
when needed.
The travel budget is extremely small, $4K for 16 faculty, but more is usually available upon request from
the Dean. New faculty have received considerable start-up money for the first one or two years.

Adequacy of Library Resources
Library resources are mostly adequate with access to databases, journals, reviews, and new book
acquisitions.

Standard G - Relationships with External Communities

<u>Description of Role in External Communities</u>
The department relationship and presence in <u>local public schools</u> is strong. We schedule about 4 PD courses a year for in-service teachers. These are funded by state grants or by the school district and mostly instructed by department faculty. Department faculty also provide an occasional training session on a volunteer basis.

Currently there is a big initiative to start <u>concurrent enrollment</u> courses funded by a grant from the Utah System of Higher Education (USHE). Math faculty have been overloaded by the work. Efforts include training teachers, writing materials, and meetings. There is a temporary staff position directed by CSME and the department chair. (We anticipate the position will become permanent.)

Several faculty are also involved with <u>math competitions</u> for junior and senior high students.   For the next three years we will be hosting the State Math Competition.

Most faculty attend the annual meeting of the Intermountain Section of the <u>MAA</u>. We hosted the meeting in April of 2016. Kent Kidman is the department representative on the board.

<u>Summary of External Advisory Committee Minutes</u>
Meeting with representatives from the local schools, Hill Airforce Base, industry, and University of Utah:
	Many comments about our Math Education program, some complements and some advice for improvement,
	Many complements about our high standards, these improved the critical thinking of graduates,
	 Several members suggested that we incorporate programming which we are doing, see curriculum.

Standard H – Program Summary
Results of Previous Program Reviews

Date of Program Review: April 2013	Recommendation	Progress Description
Recommendation 1 Hire more faculty	Text of recommendation The most pressing challenge facing the Department is the need for extra faculty resources. More faculty are needed to offer required courses more routinely and to lessen the dependence on adjunct faculty. We urge the central administration to take this seriously.	Update Fall 2017 Summary The department has essentially received no increase of faculty to teach courses. We were only able to replace retiring faculty. The last retirement resulted in two new math ed faculty both half time in the CSME. This is a good result since it will increase outreach. 20 20 20 20 20 A history follows:

Two Math Ed faculty were sought whose duties were to be split at 50% between Math and CSME. These two each at one half time for Math amount to a replacement for a retirement to take place in Dec. of 2016. The college was able to hire one Tw 1.117 TD31efment for a

	guide the Department's grant -writing activities.	
Pursue Grants		Fall 2013 The Departmental Assessment Planning committee has been charged with locating grants opportunities that would be appropriate and accessible. Fall 2014 Nothing new to report. Update-Fall 2015 Nothing New to report in the area of state and national grants. A few faculty applied for internal grants. A couple of these were funded. Update for Year 2015-2016 Nothing New to report in the area of national grants. One of the Math Ed faculty received two grants from the state offices. A few faculty applied for internal grants. A couple of these were funded. Update for Year 2016-2017 Nothing new to report.

		opportunities. The Chair continues to make any exceptions to programs of study. Update for Year 2015-2016 Advisor assignments continue
Recommendation 4		
Pursue alternative approaches in Gateway courses	Success rates are high in gateway courses such as Math 1050 and 1210, but faculty should be encouraged, possibly by being offered teaching release time, to pursue alternative approaches to these courses to further build on their strong success rates. Alternative approaches should be studied for effectiveness and then modified, discarded, or expanded as appropriate.	Summary Regular faculty are doing this, but many adjuncts make no efforts to do so. They do not have the funds nor time for PD. A History Follows
		Fall 2013 Faculty have been attending conferences on math teaching methods. They have reported on those conferences. Faculty have been using and evaluating these ideas and techniques in their courses. Fall 2014

	multiple-choice questions for some portion of examinations as many mathematical tasks can be appropriately assessed using them. Course coordinator positions would be needed (to oversee the final exam writing and visit the classrooms of adjunct faculty). Course coordinators could be compensated with release time.	
		Fall 2013, The department curriculum committees is seriously considering common final exams in Math 1050, 1210, and 2012. It may help students retain the needed skills in subsequent courses. Fall 2014 This is still being considered but delayed due to moving to temporary quarters due to the construction of the new COS building. Fall 2015 A committee was set up to oversee this but other demands such as audits, moving to new quarters, changes in the prerequisites for

| | | lower level courses has made progress slow. But, this appears to be on schedule to occur in Fall of 2016, due to the need to reserve a Block of time available and record that in the Final Exam schedule.

Update for year 2015-2016
Math 1210 and 1220 had common final exams in spring of 2016. |
| Recommendation 6
Mentor new faculty | Consider instituting apppppp521.5e | Summary: DONE |

		A draft set of goals and a draft strategic plan were authored in Spring of 2016.

Summary Information (as needed)

Action Plan for Ongoing Assessment Based on Current Self Study Findings

Action Plan for Evidence of Learning Related Findings

Results	Action to Be Taken
1. Each course has a set of learning outcomes specific to the course. QL courses have a common set of learning outcomes adopted by the university level General Education Committee. Almost all the learning outcomes for every course were	

Action Plan for Staff, Administration, or Budgetary Findings

Problem	
1. Increase the number of majors	Advertise Obtain specialized outside grants

Summary of Artifact Collection Procedure

APPENDICES

Appendix A: Student and Faculty Statistical Summary (Note

[1] **Student Credit Hours Total** represents the total department-related credit hours for all students per academic year. Includes only students reported in Banner system as registered for credit at the time of data downloads.

[2] **Student FTE Total** is the Student Credit Hours Total divided by 30.

[3] **Student Majors** is a snapshot taken from self-report data by students in their Banner profile as of the third week of the Fall term for the academic year. Only 1st majors count for official reporting.

[4] **Program Graduates** includes only those students who completed <u>all</u> graduation requirements by end of Spring semester for the academic year of interest. Students who do not meet this requirement are included in the academic year in which all requirements are met. Summer is the first term in each academic year.

[5] **Student Demographic Profile** is data retrieved from the Banner system.

Appendix B: Contract/Adjunct Faculty Profile

Department of Mathematics
<u>Contract Faculty Profile 2013 to 2018</u>

NAME	GENDER	ETHNICITY	RANK	TENURE STATUS	HIGHEST DEGREE	YEARS OF TEACHING	AREAS OF EXPERTISE
Mahmud Akelbek	M	Asian	Associate Professor	Tenured	Ph.D.	7	Combinatorics; Graph Theory
Bachman, Rachel	F	Caucasian	Assistant Professor	Tenure Track	E.ED	5	Math Education
Broderick, Shawn[1]	M	Caucasian	Assistant professor	Tenure Track	PhD	5	Math Education, Geometry

Cai, Chloe   F   AsiaA

Name	Sex	Ethnicity	Rank	Tenure	Degree	Years	Specialty
Kvernadze, George	M	Caucasian	Professor	Tenured	Ph.D.	20	Approximation Theory
Ondrus, Matthew	M	Caucasian	Associate Professor	Tenured	Ph.D.	14	Representation theory of quantum groups and related algebras
Peters, James	M	Caucasian	Associate Professor	Tenured	Ph.D.	30	PDE's and Numerical Analysis
Steele, T.H.[1]	M	Caucasian	Professor	Tenured	Ph.D.	24	Real Analysis
Talaga, Paul	M	Caucasian	Professor	Tenured	Ph.D.	40	Differential Equations
Walters, C David[2]	M	Caucasian	Assistant Professor	Tenure track	Ph D.	1	Math Education

Developmental M

| Carrie Quesnell | Female | Caucasian | Instructor | No | BS | 17 | Dev Math, PreCalculus |

Appendix C: Staff Profile

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Name	Gender	Ethnicity	Job Title	Years of Employment	Areas of Expertise

Appendix E: External Community Involvement Names and Organizations

Name	Organization
Berkenpas, John	ATK-Orbits
Kubica, Kris	JBT AeroTech
Murray, April	Walquist Jr. High

Nowlin, Col Scott