

Weber State University
Annual Assessment of Evidence of Learning

Cover Page

Department/Program: Mathematics
Academic Year of Report: 2015/16
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A. Brief Introductory Statement:

Please review the Introductory Statement and contact information for your department displayed on the assessment site:

<http://www.weber.edu/portfolio/departments.html> - if this information is current, please place an 'X' below. No further information is needed. We will indicate "Last Reviewed: [current date]" on the page.

Information is current; no changes required.

Information is not current; updates below.

Update: Our location changed to Tracey Hall Science Center, TY 381

B. Mission Statement

Please review the Mission Statement for your department displayed on the assessment site: <http://www.weber.edu/portfolio/departments.html> - if it is current, please indicate as much; we will mark the web page as “Last Reviewed [current date]”. No further information is needed. If the information is not current, please provide an update:

Information is current; no changes required.

Information is not current; updates below.

C. Student Learning Outcomes

Please review the Student Learning Outcomes for your department displayed on the assessment site:

<http://www.weber.edu/portfolio/departments.html> - if they are current, please indicate as much; we will mark the web page as “Last Reviewed [current date]”. No further information is needed.

If they are not current, please provide an update:

Information is current; no changes required.

Information is not current; updates below.

Measurable Learning Outcomes

At the end of their study at WSU, students in this program will:

- 1) ...
- 2) ...
- 3) ...
- 4) ...
- 5) ...
- 6) etc.

D. Curriculum

Please review the Curriculum Grid for your department displayed on the assessment site: <http://www.weber.edu/portfolio/departments.html> - if it is current, please indicate as much; we will mark the web page as “Last Reviewed: [current data]”. No further information is needed. If the curriculum grid is not current, please provide an update:

Information is current; no changes required.

Information is not current; updates below

E. Assessment Plan

Please review the Assessment Plan for your department displayed on the assessment site: <http://www.weber.edu/portfolio/departments.html> - if the plan current, please indicate as much; we will mark the web page as “Last Reviewed [current date]”. No further information is needed.

The site should contain an up-to-date assessment plan with planning going out a minimum of three years beyond the current year. Please review the plan displayed for your department at the above site. The plan should include a list of courses from which data will be gathered and the schedule, as well as an overview of the assessment strategy the department is using (for example, portfolios, or a combination of Chi assessment data and student survey information, or industry certification exams, etc.).

Please be sure to include your planned assessment of any general education courses taught within your department. This information will be used to update the General Education Improvement and Assessment Committee’s planning documentation.

Assessment plan: **The assessment plan listed is not complete. Please add this to the bottom of what is there:**

Measurable Course Learning Outcomes and Action Plan for Program Courses beyond QL courses Course learning outcomes for each of the required courses for math majors and elementary majors are listed Appendix H. The curriculum impact grids in C. 5. show the extent to which these learning outcomes impact the program learning outcomes for the math majors. The outcomes are available electronically to department members on the department’s network drive. Each time a course above 1080 is taught the instructor will target each of the course learning outcomes with test questions or papers or projects and report the on the student completion rates. See the section on QL below for the assessment plan for the QL course Math 1030, 1040, 1050, 1080. Thresholds will be established according to Bloom’s Taxonomy and method of measurement in the range of 65% to 70%. For example a question on a midterm exam is more immediate and will have a rate of 70% while a question on a comprehensive final could have a rate of 65%. Projects or papers will have a rate 70 %. If the completion rates do not meet the thresholds then there will be discussions with the appropriate committee and department to determine the reason and formulate a course of action such as new texts, new approaches, additional homework, etc.

Evidence of learning Spreadsheets

Evidence of learning spreadsheets will be used to assess the learning in each course. Instructors of required courses for majors and elementary education math courses will submit the spreadsheets at the time grades are due (Starting Spring of 2013). Exact details vary by course. The spreadsheets are available electronically to department members. Two samples follow:

A. Evidence of Learning: MATH 1210 Calculus I				
Measurable Learning Outcome Students will...	Method of Measurement	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
1.A: Use algebraic techniques to evaluate limits.	Measure 1: Question on an exam	Measure 1: TBD	Measure 1: TBD	Measure 1: TBD
	Measure 2: Course pass rate	Measure 2: TBD	Measure 2: TBD	Measure 2: TBD
2.A: Find derivative of algebraic and trigonometric functions, defined explicitly or implicitly, using differentiation rules: power, product, quotient, and chain rules and implicit differentiation.	Measure 1: Question on an exam	Measure 1: TBD	Measure 1: TBD	Measure 1: TBD
	Measure 2: Course pass rate	Measure 2: TBD	Measure 2: TBD	Measure 2: TBD
3.A: Interpret derivative as the rate of change and use it to find equation of a tangent line, find velocity and acceleration, approximate value of a function, approximate a zero of a function or solve related rate problems.	Measure 1: Question on an exam	Measure 1: TBD	Measure 1: TBD	Measure 1: TBD
	Measure 2: Course pass rate	Measure 2: TBD	Measure 2: TBD	Measure 2: TBD
4.A: Understand the role of first and second derivatives in the shape of graphs.	Measure 1: Question on an exam	Measure 1: TBD	Measure 1: TBD	Measure 1: TBD
	Measure 2: Course pass rate	Measure 2: TBD	Measure 2: TBD	Measure 2: TBD
5.A: Solve optimization application problems.	Measure 1: Question on an exam	Measure 1: TBD	Measure 1: TBD	Measure 1: TBD
	Measure 2: Course pass rate	Measure 2: TBD	Measure 2: TBD	Measure 2: TBD
6.A: Evaluate definite and indefinite integrals using basic integration techniques, including substitution.	Measure 1: Question on an exam	Measure 1: TBD	Measure 1: TBD	Measure 1: TBD
	Measure 2: Course pass rate	Measure 2: TBD	Measure 2: TBD	Measure 2: TBD
7.A: Interpret the definite integral as a sum and use it to find areas, volumes or the work done by a variable force.	Measure 1: Question on an exam	Measure 1: TBD	Measure 1: TBD	Measure 1: TBD
	Measure 2: Course pass rate	Measure 2: TBD	Measure 2: TBD	Measure 2: TBD

A. Evidence of Learning: MATH 1210 Calculus I				
Measurable Learning Outcome Students will...	Method of Measurement Direct and Indirect Measures*	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
8.A: Be able to use definitions to prove value of a limit, find derivative of a function or evaluate a definite integral, for simple functions.	Measure 1: Question on an exam	Measure 1: TBD	Measure 1: TBD	Measure 1: TBD
	Measure 2: Course pass rate	Measure 2: TBD	Measure 2: TBD	Measure 2: TBD
9.A: Understand important theorems such as Intermediate Value Theorem, Extreme value Theorem, Rolle's Theorem, Differential or Integral Mean Value Theorems or Fundamental Theorem of Calculus.	Measure 1: Question on an exam	Measure 1: TBD	Measure 1: TBD	Measure 1: TBD
	Measure 2: Course pass rate	Measure 2: TBD	Measure 2: TBD	Measure 2: TBD

*At least one measure per objective must be a direct measure; indirect measures may be used to supplement direct measure(s).

B. Evidence of Learning: MATH 2120 Euclidean Geometry				
Measurable Learning Outcome Students will...	Method of Measurement Direct and Indirect Measures*	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
1.A: Know when it is necessary to write a proof and develop the ability to write proofs in the setting of Euclidean geometry.	Measure 1: Question on an exam	Measure 1: TBD	Measure 1: TBD	Measure 1: TBD
	Measure 2: Course pass rate	Measure 2: TBD	Measure 2: TBD	Measure 2: TBD
2.A: Know and understand definitions and basic theorems regarding Euclidean notions of angles, congruence, parallel lines, similarity, and circles.	Measure 1: Question on an exam	Measure 1: TBD	Measure 1: TBD	Measure 1: TBD
	Measure 2: Course pass rate	Measure 2: TBD	Measure 2: TBD	Measure 2: TBD
3.A: Solve problems and prove theorems relating to Euclidean notions of angles, congruence, parallel lines, similarity, and circles.	Measure 1: Question on an exam	Measure 1: TBD	Measure 1: TBD	Measure 1: TBD
	Measure 2: Course pass rate	Measure 2: TBD	Measure 2: TBD	Measure 2: TBD

*At least one measure per objective must be a direct measure; indirect measures may be used to supplement direct measure(s).

High Impact or Service Learning: There is one capstone course for the Math Teaching Major. It will be assessed as the other courses for the major. Math majors get some of this type of experience in several courses. In a few of the upper level courses students are required to solve problems and write papers individually or in groups and sometimes give presentations on the results. There is a “capstone course” for the applied math majors. It is Math 3550, Mathematical Modeling. In this course students create original models/solutions to applied problems and sometimes work on these in groups. These will be assessed with evidence of learning spreadsheets.

General Education QL Assessment Plan

Beginning in Spring of 2012, the Department QL Committee authored 5 Final Exam Questions for each of the QL courses, Math 1030, 1040, 1050, and 1080. The questions will test the 5 QL learning outcomes in each course. All instructors were to add the questions to their final exams and report the completion rate for each of the questions. The completion rate for each question across all sections and total pass rates for all sections were compiled. The results are reported in the evidence of learning outcomes spreadsheets. If the thresholds are not reached then discussions will take place between the instructor and the Quantitative Literacy Committee to determine the reason. This will be done each semester (Fall and Spring) until the thresholds are reached. After that the procedure will be suspended until needed for QL renewal.

Summary of Artifact Collection Procedure

Artifact	Learning Outcome Measured	When/How Collected?	Where Stored?
Final Exams	Learning Outcomes	End of semester	Paper in Department files
Student Projects/Papers	Student success	End of semester	Department files
Chi Tester Outcome Report on teaching evaluations	Teaching	End of semester	a. Electronic format (chi tester warehouse) b. Paper, stored in department files
Pass rates	Student success	End of Semester	Electronic copies
Graduate Exit surveys	Overall program, graduate and employment rate	Graduation Sign Off Chi Tester Survey	Electronic copies
Major Survey	Major opinions	Chi Tester Survey	Electronic copies

F. Report of assessment results for the most previous academic year:

There are a variety of ways in which departments can choose to show evidence of learning. This is one example. The critical pieces to include are 1) what learning outcome is being assessed, 2) what method of measurement was used, 3) what the threshold for 'acceptable performance' is for that measurement, 4) what the actual results of the assessment were, 5) how those findings are interpreted, and 6) what is the course of action to be taken based upon the interpretation.

a. Evidence of Learning: Courses within the Major

Notes:

1. Math 1050 and Math 1080 are required for the Major as they are prerequisites for Math 1210. Since they carry the QL attribute, their assessments are included in the General Education section below.
2. Math 1050, 1060, 1080 are required for the major programs since they are prerequisites for Math 1210, Calculus I.
3. Course pass rates for courses that have multiple sections were compiled into one spreadsheet.
4. Pass means students earned a grade of C or better.
5. All results will be reported to the Faculty and discussed during department meetings.
6. The action plans in cases where the threshold was not met is to discuss the reasons for the result and discuss methods to improve student understanding including more emphasis, homework, quizzes, and in class work.

C. Evidence of Learning: MATH 1060 Trigonometry ¹				
Measurable Learning Outcome Students will...	Method of Measurement Direct and Indirect Measures*	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
1.A: Understand trigonometric and inverse trigonometric functions and be able to find their exact values for standard angles and numbers.	Question on homework, midterm, or final exam.	80% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	82.52% passed	Students successfully met this objective over the 70% threshold	None
2.A: Be able to solve right and oblique triangles using the definitions of trigonometric functions and Laws of Sines or Cosines.	Question on homework, midterm, or final exam.	74% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	82.52% passed	Students successfully met this objective over the 70% threshold	None
3.A: Solve application problems by solving appropriate triangles.	Question on homework, midterm, or final exam.	88% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	82.52% passed	Students successfully met this objective over the 70% threshold	None
4.A: Graph trigonometric functions.	Question on homework, midterm, or final exam.	73% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	82.52% passed	Students successfully met this objective over the 70% threshold	None
5.A: Know standard trigonometric identities and be able to establish or disprove equations as trigonometric identities.	Question on homework, midterm, or final exam.	76% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	82.52% passed	Students successfully met this objective over the 70% threshold	None
6.A: Be able to solve trigonometric equations.	Question on homework, midterm, or final exam.	81% correct	Students successfully met this objective over the 70% threshold	None

¹ MATH 1060 pass rate from Spring 2016 (201630), one section

C. Evidence of Learning: MATH 1060 Trigonometry ¹				
Measurable Learning Outcome	Method of Measurement	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Students will...	Direct and Indirect Measures*			
	Course pass rate	82.52% passed	Students successfully met this objective over the 70% threshold	None
7.A: Understand vectors and vector algebra and be able to solve applied problems using vectors.	Question on homework, midterm, or final exam.	89% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	82.52% passed	Students successfully met this objective over the 70% threshold	None
8.A: Understand polar coordinates and graph polar equations.	Question on homework, midterm, or final exam.	84% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	82.52% passed	Students successfully met this objective over the 70% threshold	None

*At least one measure per objective must be a direct measure; indirect measures may be used to supplement direct measure(s).

D. Evidence of Learning: MATH 1210 Calculus I²				
Measurable Learning Outcome	Method of Measurement	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Students will...	Direct and Indirect Measures*			
1.A: Use algebraic techniques to evaluate limits.	Question on homework, midterm, or final exam.	80% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	70.83% passed	Students successfully met this objective over the 70% threshold	None
2.A: Find derivative of algebraic and trigonometric functions, defined explicitly or implicitly, using differentiation rules: power, product, quotient, and chain rules and implicit differentiation.	Question on homework, midterm, or final exam.	77% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	70.83% passed	Students successfully met this objective over the 70% threshold	None
3.A: Interpret derivative as the rate of change and use it to find equation of a tangent line, find velocity and acceleration, approximate value of a function, approximate a zero of a function or solve related rate problems.	Question on homework, midterm, or final exam.	78% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	70.83% passed	Students successfully met this objective over the 70% threshold	None
4.A: Understand the role of first and second derivatives in the shape of graphs.	Question on homework, midterm, or final exam.	73% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	70.83% passed	Students successfully met this objective over the 70% threshold	None
5.A: Solve optimization application problems.	Question on homework, midterm, or final exam.	68% correct	Students did not successfully meet this objective over the 70% threshold	The department intends to increase emphasis, explanation, practice, quizzes,...
	Course pass rate	70.83% passed	Students successfully met this objective over the 70% threshold	None

² MATH 1210 pass rate from Spring 2016 (201630)

D. Evidence of Learning: MATH 1210 Calculus I²				
Measurable Learning Outcome	Method of Measurement	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Students will...	Direct and Indirect Measures*			
6.A: Evaluate definite and indefinite integrals using basic integration techniques, including substitution.	Question on homework, midterm, or final exam.	65% correct	Students did not successfully meet this objective over the 70% threshold	The department intends to increase emphasis, explanation, practice, quizzes,...
	Course pass rate	70.83% passed	Students successfully met this objective over the 70% threshold	None
7.A: Interpret the definite integral as a sum and use it to find areas, volumes or the work done by a variable force.	Question on homework, midterm, or final exam	72% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	70.83% passed	Students successfully met this objective over the 70% threshold	None
8.A: Be able to use definitions to prove value of a limit, find derivative of a function or evaluate a definite integral, for simple functions.	Question on homework, midterm, or final exam	75% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	70.83% passed	Students successfully met this objective over the 70% threshold	None
9.A: Understand important theorems such as Intermediate Value Theorem, Extreme value Theorem, Rolle's Theorem, Differential or Integral Mean Value Theorems or Fundamental Theorem of Calculus.	Question on homework, midterm, or final exam	81% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	70.83% passed	Students successfully met this objective over the 70% threshold	None

*At least one measure per objective must be a direct measure; indirect measures may be used to supplement direct measure(s).

A. Evidence of Learning: MATH 1220 Calculus II ³				
Measurable Learning Outcome	Method of Measurement	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Students will...	Direct and Indirect Measures*			
1.A: Evaluate limits using L'Hospital's Rule.	Question on exam	71% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	73.74% passed	Students successfully met this objective over the 70% threshold	None
2.A: Find derivative of exponential, logarithmic, inverse trigonometric and inverse functions.	Question on homework, midterm, or final exam	86% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	73.74% passed	Students successfully met this objective over the 70% threshold	None
3.A: Evaluate definite, indefinite, and improper integrals using integration techniques: integration by parts, trigonometric substitution, partial fractions and trigonometric identities.	Question on homework, midterm, or final exam	78% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	73.74% passed	Students successfully met this objective over the 70% threshold	None
4.A: Use integrals to find arc length, surface area, pressure, center of mass or probability.	Question on homework, midterm, or final exam	74% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	73.74% passed	Students successfully met this objective over the 70% threshold	None
5.A: Understand parametric equations and polar coordinates and use them in graphing, finding tangent lines, or calculating arc lengths and areas.	Question on homework, midterm, or final exam	86% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	73.74% passed	Students successfully met this objective over the 70% threshold	None
6.A: Be familiar with conic sections.	Question on homework, midterm, or final exam	83% correct	Students successfully met this objective over the 70% threshold	None

³ MATH 1220 pass rates from Fall 2015 (201620)

A. Evidence of Learning: MATH 1220 Calculus II ³				
Measurable Learning Outcome	Method of Measurement	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Students will...	Direct and Indirect Measures*			
	Course pass rate	73.74% passed	Students successfully met this objective over the 70% threshold	None
7.A: Calculate the sum of a geometric or telescoping series.	Question on homework, midterm, or final exam	75% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	73.74% passed	Students successfully met this objective over the 70% threshold	None
8.A: Test for convergence of a series using an appropriate test: divergence, integral, comparison and limit comparison, ratio, root, or alternating series.	Question on homework, midterm, or final exam	71% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	73.74% passed	Students successfully met this objective over the 70% threshold	None
9.A: Find the power series of functions, determine their radius and interval of convergence, and use differentiation, integration and combination to develop new power series or use them to estimate, integrate or find the limits.	Question on homework, midterm, or final exam	78% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	73.74% passed	Students successfully met this objective over the 70% threshold	None

*At least one measure per objective must be a direct measure; indirect measures may be used to supplement direct measure(s).

E. Evidence of Learning: MATH 2120 Euclidean Geometry ⁴⁵				
Measurable Learning Outcome	Method of Measurement	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Students will...	Direct and Indirect Measures*			
1.A: Know when it is necessary to write a proof and develop the ability to write proofs in the setting of Euclidean geometry.	Question on homework, midterm, or final exam	Not assessed	Measure 1: TBD	To be done Fall 2016
	Course pass rate	69.23% passed	Students did not successfully meet this objective over the 70% threshold	Result close to the threshold discussion to take place.
2.A: Know and understand definitions and basic theorems regarding Euclidean notions of angles, congruence, parallel lines, similarity, and circles.	Question on homework, midterm, or final exam	Not assessed	Measure 1: TBD	To be done Fall 2016
	Course pass rate	69.23% passed	Students did not successfully meet this objective over the 70% threshold	Result close to the threshold discussion to take place.
3.A: Solve problems and prove theorems relating to Euclidean notions of angles, congruence, parallel lines, similarity, and circles.	Question on homework, midterm, or final exam	Not assessed	Measure 1: TBD	To be done Fall 2016
	Course pass rate	69.23% passed	Students did not successfully meet this objective over the 70% threshold	Result close to the threshold discussion to take place.

*At least one measure per objective must be a direct measure; indirect measures may be used to supplement direct measure(s).
Note: Instructor was assigned to gather data for the learning outcomes, but data was not submitted to online spreadsheet.

⁴ MATH 2120 offered fall semesters.

⁵ MATH 2120 pass rate from Fall 2015 (201620)

B. Evidence of Learning: MATH 2210 Calculus III ⁶				
Measurable Learning Outcome	Method of Measurement	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Students will...	Direct and Indirect Measures*			
1.A: Understand vectors and vector algebra. Use vectors to solve applied problems and find equations of lines and planes in three dimensions.	Question on homework, midterm, or final exam	% passed	Students successfully met this objective over the 70% threshold in the past	None
	Course pass rate	86.05% passed	Students successfully met this objective over the 70% threshold	None
2.A: Understand vector-valued functions. Find the derivatives and integrals of vector-valued functions. Find arc length or curvature of space curves, or use vector-valued functions to describe motion in space.	Question on homework, midterm, or final exam	% passed	Students successfully met this objective over the 70% threshold in the past	None
	Course pass rate	86.05% passed	Students successfully met this objective over the 70% threshold	None
3.A: Be familiar with quadric surfaces.	Question on homework, midterm, or final exam	% passed	Students successfully met this objective over the 70% threshold in the past	None
	Course pass rate	86.05% passed	Students successfully met this objective over the 70% threshold	None
4.A: Understand limits of functions of two variables and find partial derivatives of functions of two or more variables.	Question on homework, midterm, or final exam	% passed	Students successfully met this objective over the 70% threshold in the past	
	Course pass rate	86.05% passed	Students successfully met this objective over the 70% threshold	None
5.A: Use partial derivatives to find directional derivatives, equations of a tangent planes or approximate values of functions of two or more variables and solve optimization application problems involving functions of two variables.	Question on homework, midterm, or final exam	% passed	Students successfully met this objective over the 70% threshold in the past	None
	Course pass rate	86.05% passed	Students successfully met this objective over the 70% threshold	None

⁶ MATH 2210 pass rate from Spring 2016 (201630)

B. Evidence of Learning: MATH 2210 Calculus III ⁶				
Measurable Learning Outcome	Method of Measurement	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Students will...	Direct and Indirect Measures*			
6.A: Understand multiple integrals. Evaluate double and triple integrals in Cartesian, polar, cylindrical and spherical coordinates.	Question on homework, midterm, or final exam	% passed	Students successfully met this objective over the 70% threshold in the past	None
	Course pass rate	86.05% passed	Students successfully met this objective over the 70% threshold	None
7.A: Interpret the multiple definite integral as a sum and use it to find areas, volumes, mass or moments.	Question on homework, midterm, or final exam	% passed	Students successfully met this objective over the 70% threshold in the past	None
	Course pass rate	86.05% passed	Students successfully met this objective over the 70% threshold	None
8.A: Understand vector fields and use them to find line integrals, surface integrals or work.	Question on homework, midterm, or final exam	% passed	Students successfully met this objective over the 70% threshold in the past	None
	Course pass rate	86.05% passed	Students successfully met this objective over the 70% threshold	None
9.A: Understand important theorems such as Green's, Stokes' or divergence theorems.	Question on homework, midterm, or final exam	% passed	Students successfully met this objective over the 70% threshold in the past	None
	Course pass rate	86.05% passed	Students successfully met this objective over the 70% threshold	None

*At least one measure per objective must be a direct measure; indirect measures may be used to supplement direct measure(s).

C. Evidence of Learning: MATH 2250 Linear Algebra and Differential Equations ^{7 8}				
Measurable Learning Outcome	Method of Measurement	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Students will...	Direct and Indirect Measures*			
1.A: Solve a first order differential equation that is linear, separable or exact.	Question on homework, midterm, or final exam	% passed	Students successfully met this objective over the 70% threshold in the past	None
	Course pass rate	88.89% passed	Students successfully met this objective over the 70% threshold in the past	None
2.A: Solve a second or higher order linear nonhomogeneous differential equation with constant coefficients by the method of undetermined coefficients, the method of variation of parameters or by reduction of order.	Question on homework, midterm, or final exam	% passed	Students successfully met this objective over the 70% threshold in the past	None
	Course pass rate	88.89% passed	Students successfully met this objective over the 70% threshold in the past	None
3.A: Solve a linear homogeneous or nonhomogeneous system of differential equations with constant coefficients by any method.	Question on homework, midterm, or final exam	% passed	Students successfully met this objective over the 70% threshold in the past	None
	Course pass rate	88.89% passed	Students successfully met this objective over the 70% threshold in the past	None
4.A: Reformulate a linear system of equations as a single matrix equation and solve it by Gaussian Elimination, the use of inverses or Cramer=s Rule.	Question on homework, midterm, or final exam	% passed	Students successfully met this objective over the 70% threshold in the past	None
	Course pass rate	88.89% passed	Students successfully met this objective over the 70% threshold in the past	None
5.A: Identify and work with generic vector spaces, determine subspaces, bases and dimension and characterize orthogonality properties.	Question on homework, midterm, or final exam	% passed	Students successfully met this objective over the 70% threshold in the past	None
	Course pass rate	88.89% passed	Students successfully met this objective over the 70% threshold in the past	None

⁷ MATH 2250 not a required course for Math majors but is required for some Engineering majors.

⁸ MATH 2250 pass rate from Spring 2016 (201630)

C. Evidence of Learning: MATH 2250 Linear Algebra and Differential Equations ^{7 8}				
Measurable Learning Outcome	Method of Measurement	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Students will...	Direct and Indirect Measures*			
6.A: Find the eigenvalues and corresponding eigenspaces for a generic (n x n) matrix.	Question on homework, midterm, or final exam	% passed	Students successfully met this objective over the 70% threshold in the past	None
	Course pass rate	88.89% passed	Students successfully met this objective over the 70% threshold in the past	None

*At least one measure per objective must be a direct measure; indirect measures may be used to supplement direct measure(s).

A. Evidence of Learning: MATH 2270 Elementary Linear Algebra ⁹				
Measurable Learning Outcome Students will...	Method of Measurement Direct and Indirect Measures*	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
1.A: Know how to solve systems of linear equations.	Question on homework, midterm, or final exam	83% passed	Students successfully met this objective over the 75% threshold	None
	Course pass rate	85% and 85.71% passed	Students successfully met this objective over the 70% threshold	None
2.A: Know, understand, and be able to apply the concepts of matrices, matrix algebra, and determinants to solve problems.	Question on homework, midterm, or final exam	87% passed	Students successfully met this objective over the 75% threshold	None
	Course pass rate	85% and 85.71% passed	Students successfully met this objective over the 75% threshold	None
3.A: Know, understand, and be able to apply the concepts of vector spaces to calculate results, establish basic theorems, and prove conjectures in a clear and mathematically correct way.	Question on homework, midterm, or final exam	80% passed	Students successfully met this objective over the 75% threshold	None
	Course pass rate	85% and 85.71% passed	Students successfully met this objective over the 70% threshold	None
4.A: Know, understand, and be able to apply the concept of linear transformations to calculate results, establish basic theorems, and prove conjectures in a clear and mathematically correct way.	Question on homework, midterm, or final exam	68% passed	Students successfully met this objective over the 70% threshold	More Emphasis
	Course pass rate	85% and 85.71% passed	Students successfully met this objective over the 70% threshold	None
5.A: Be able to understand and to compute eigenvalues and eigenvectors, and apply these concepts to solving problems.	Question on homework, midterm, or final exam	81% passed	Students successfully met this objective over the 75% threshold	None
	Course pass rate	85% and 85.71% passed	Students successfully met this objective over the 70% threshold	None

⁹ MATH 2270 pass rate from Spring 2014 and 2016 respectively
Question data from Spring 2014

*At least one measure per objective must be a direct measure; indirect measures may be used to supplement direct measure(s).

Evidence of Learning: Math 2280 – Spring 2013

There are 7 learning outcomes for Math 2280, Ordinary Differential Equations.

1. Classify equations as an ordinary differential equation or not. Classify ordinary differential equations by order and linear versus non-linear. Discuss existence and uniqueness of solutions of ordinary differential equations or plot and interpret slope fields and trajectories of the first order ordinary differential equations.
2. Create an ordinary differential equation with initial value(s) to model real life applications, for example, falling bodies, growth and decay, input-output, or position of a mass on a spring. Solve the model and interpret the results.
3. Solve separable, exact and linear first order ordinary differential equations.
4. Solve second or higher order, homogeneous, linear, constant coefficients ordinary differential equations.
5. Solve second or higher order ordinary differential equations using the methods of undetermined coefficient, variation of parameter and reduction of order, as applicable.
6. Use the Laplace Transform technique to solve second order ordinary differential equations with initial values.
7. Use the series method to solve second order ordinary differential equations near an ordinary point.

The direct measure (measure 1) used was from a minimum of one to a maximum of six questions per learning outcome in the course three exams. The number of students taking exams varied during the semester. The indirect measure (measure 2) is the individual course passing rate*.

* Passing rate = (# of students with a course grade of “C” or better) / (# of students who completed the course)

Spring2013 - Math 2280 (1 section, 24 students took the first exam, 22 students took the final)					
Measurable Learning Outcome	Measure 1: Average Score	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
	Measure 2: Course Passing Rate				
Learning Outcome 1	Measure 1	70%	84%	Students successfully met this objective.	None
	Measure 2	75%	86%	Students successfully met this objective.	None
Learning Outcome 2	Measure 1	70%	73%	Students successfully met this objective.	None
	Measure 2	75%	86%	Students successfully met this objective.	None
Learning Outcome 3	Measure 1	70%	73%	Students successfully met this objective.	None
	Measure 2	75%	86%	Students successfully met this objective.	None
Learning Outcome 4	Measure 1	70%	90%	Students successfully met this objective.	None
	Measure 2	75%	86%	Students successfully met this objective.	None
Learning Outcome 5	Measure 1	70%	71%	Students successfully met this objective.	None
	Measure 2	75%	86%	Students successfully met this objective.	None
Learning Outcome 6	Measure 1	70%	91%	Students successfully met this objective.	None
	Measure 2	75%	86%	Students successfully met this objective.	None

Spring2013 - Math 2280 (1 section, 24 students took the first exam, 22 students took the final)					
Measurable Learning Outcome	Measure 1: Average Score	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
	Measure 2: Course Passing Rate				
Learning Outcome 7	Measure 1	70%	73%	Students successfully met this objective.	None
	Measure 2	75%	86%	Students successfully met this objective.	None

B. Evidence of Learning: MATH 2280 Ordinary Differential Equations ¹⁰				
Measurable Learning Outcome	Method of Measurement	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Students will...	Direct and Indirect Measures*			
1.A: Classify equations as an ordinary differential equation or not. Classify ordinary differential equations by order and linear versus non-linear. Discuss existence and uniqueness of solutions of ordinary differential equations and/or draw and interpret direction fields of the first order ordinary differential equations.	Question on homework, midterm, or final exam	84% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	86% and 100% passed	Students successfully met this objective over the 75% threshold	None
2.A: Create an ordinary differential equation with initial value(s) to model real life applications, for example, falling bodies, growth and decay, input-output, or position of a mass on a spring. Solve the model and interpret the results.	Question on homework, midterm, or final exam	73% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	86% and 100% passed	Students successfully met this objective over the 75% threshold	None
3.A: Solve separable, exact and linear first order ordinary differential equations.	Question on homework, midterm, or final exam	73% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	86% and 100% passed	Students successfully met this objective over the 75% threshold	None
4.A: Solve second or higher order, homogeneous, linear, constant coefficients ordinary differential equations.	Question on homework, midterm, or final exam	90% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	86% and 100% passed	Students successfully met this objective over the 75% threshold	None
5.A: Solve second or higher order ordinary differential equations using the methods of	Question on homework, midterm, or final exam	71% correct	Students successfully met this objective over the 70% threshold	None

¹⁰ MATH 2280 pass rate from Spring of 2013 and Spring 2016 respectively
Question data from Spring of 2013

B. Evidence of Learning: MATH 2280 Ordinary Differential Equations ¹⁰				
Measurable Learning Outcome	Method of Measurement	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Students will...	Direct and Indirect Measures*			
undetermined coefficient, variation of parameter and reduction of order, as applicable.	Course pass rate	86% and 100% passed	Students successfully met this objective over the 75% threshold	None
6.A: Use the Laplace Transform technique to solve second order ordinary differential equations with initial values.	Question on homework, midterm, or final exam	91% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	86% and 100% passed	Students successfully met this objective over the 75% threshold	None
7.A: Use the series method to solve second order ordinary differential equations near an ordinary point.	Question on homework, midterm, or final exam	73% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	86% and 100% passed	Students successfully met this objective over the 75% threshold	None

*At least one measure per objective must be a direct measure; indirect measures may be used to supplement direct measure(s).

C. Evidence of Learning: MATH 3110 Foundations of Algebra ¹¹				
Measurable Learning Outcome Students will...	Method of Measurement Direct and Indirect Measures*	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
1.A: Understand basic mathematical logic, both the definitions and applications to mathematical proof.	Question on homework, midterm, or final exam	93% passed	Students successfully met this objective over the 60% threshold	None
	Course pass rate	80.77% passed	Students successfully met this objective over the 75% threshold	None
2.A: Understand the concept of proof and demonstrate proof writing skills.	Question on homework, midterm, or final exam	68% passed	Students successfully met this objective over the 60% threshold	None
	Course pass rate	80.77% passed	Students successfully met this objective over the 75% threshold	None
3.A: Write proofs in the areas of basic set theory, number theory, and algebra.	Question on Test 3	88% passed	Students successfully met this objective over the 60% threshold	None
	Course pass rate	80.77% passed	Students successfully met this objective over the 75% threshold	None
4.A: Gain exposure to more advanced topics in algebra such as group theory and ring theory.	Question on homework, midterm, or final exam	61% passed	Students successfully meet this objective over the 60% threshold	None
	Course pass rate	80.77% passed	Students successfully met this objective over the 75% threshold	None
5.A: Be able to understand abstraction.	Question on homework, midterm, or final exam	97% passed	Students successfully met this objective over the 60% threshold	None
	Course pass rate	80.77% passed	Students successfully met this objective over the 75% threshold	None

¹¹ MATH 3110 pass rate from Spring 2016 (201630)

D. Evidence of Learning: MATH 3120 Foundations of Euclidean and Non-Euclidean Geometry ^{12 13}				
Measurable Learning Outcome	Method of Measurement	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Students will...	Direct and Indirect Measures*			
1.A: Know and understand basic definitions of Euclidean, neutral, and hyperbolic geometry.	Question on homework, midterm, or final exam	% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	100% passed	Students successfully met this objective over the 75% threshold	None
2.A: Demonstrate the ability to write proofs clearly and concisely.	Question on homework, midterm, or final exam	% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	100% passed	Students successfully met this objective over the 75% threshold	None
3.A: Use axiom systems to prove basic theorems in Euclidean, neutral, and hyperbolic geometry.	Question on homework, midterm, or final exam	% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	100% passed	Students successfully met this objective over the 75% threshold	None
4.A: Use basic theorems of Euclidean, neutral, and hyperbolic geometry to prove additional theorems.	Question on homework, midterm, or final exam	% correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	100% passed	Students successfully met this objective over the 75% threshold	None

*At least one measure per objective must be a direct measure; indirect measures may be used to supplement direct measure(s).

¹² MATH 3120 offered spring semesters.

¹³ MATH 3120 pass rate from Spring 2016 (201630)

E. Evidence of Learning: MATH 3160 Number Theory ¹⁴				
Measurable Learning Outcome Students will...	Method of Measurement Direct and Indirect Measures*	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
1.A: Prove an appropriate statement using Mathematical Induction.	Question on homework, midterm, or final exam	90% passed	Students successfully met this objective over the 70% threshold	None
	Course pass rate	92.86% passed	Students successfully met this objective over the 70% threshold	None
2.A: Solve a linear Diophantine and congruence equation.	Question on homework, midterm, or final exam	84% passed	Students successfully met this objective over the 70% threshold	None
	Course pass rate	92.86% passed	Students successfully met this objective over the 70% threshold	None
3.A: Be familiar with the Fundamental Theorem of Arithmetic, the Chinese Remainder Theorem, and Euler's Theorem, and be able to use those results to prove and/or calculate a posed theoretical or applied problem in a clear and mathematically correct way.	Question on homework, midterm, or final exam	96% passed	Students successfully met this objective over the 70% threshold	None
	Course pass rate	92.86% passed	Students successfully met this objective over the 70% threshold	None
4.A: Be familiar with multiplicative functions, the Euler Phi-function, Mobius inversion, and be able to use those results to prove and/or calculate a posed theoretical or applied problem.	Question on homework, midterm, or final exam	64% passed	Students did not successfully meet this objective over the 70% threshold	To be discussed, more emphasis
	Course pass rate	92.86% passed	Students successfully met this objective over the 70% threshold	None
5.A: Be familiar with primitive roots and be able to use this concept to prove and/or	Question on homework, midterm, or final exam	70% passed	Students successfully met this objective over the 70% threshold	None

¹⁴ MATH 3160 pass rate is from spring 2016 (201630).

E. Evidence of Learning: MATH 3160 Number Theory ¹⁴				
Measurable Learning Outcome	Method of Measurement	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Students will...	Direct and Indirect Measures*			
calculate a posed theoretical or applied problem.	Course pass rate	92.86% passed	Students successfully met this objective over the 70% threshold	None

*At least one measure per objective must be a direct measure; indirect measures may be used to supplement direct measure(s).

Evidence of Learning: Math 3280 – Spring 2016

There are 7 learning outcomes for Math 3280, Dynamical Systems.

1. Solve and/or analyze one-dimensional first order ordinary differential equations, such as plotting phase lines and slope fields and trajectories, and identifying stability of equilibrium points.
2. Recognize bifurcations and find bifurcation points of one-dimensional or planar dynamical systems.
3. Solve and analyze linear, planar dynamical systems.
4. Analyze nonlinear autonomous planar dynamical systems, such as plotting phase plane portraits, identifying stability of equilibrium points, and existence or non-existence of periodic solutions and limit cycles.
5. Use both analytic and geometric techniques to analyze mathematical models such as population dynamics or harmonic oscillations.
6. Use software packages, such as Mathematica, to plot phase portraits of dynamical systems and to conjecture/demonstrate their properties.
7. Learn two additional topics, for example, existence and uniqueness theorems, Poincare-Bendixon theorem, Liapunov functions, Hamiltonian and dissipative systems, higher dimensional systems, discrete dynamical systems, chaos, and contraction mapping theorem.

The direct measure (measure 1) used was from a minimum of one to a maximum of six questions per learning outcome in the course three exams. The number of students taking exams varied during the semester. The indirect measure (measure 2) is the individual course passing rate*.

* Passing rate = (# of students with a course grade of "C" or better) / (# of students who completed the course)

Spring 2016 - Math 3280 (1 section, 14 students)					
Measurable Learning Outcome	Measure 1: Average Score	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
	Measure 2: Course Passing Rate				
Learning Outcome 1	Measure 1	70%	92%	Students successfully met this objective.	None
	Measure 2	75%	93%	Students successfully met this objective.	None

Learning Outcome 2	Measure 1	70%	85%	Students successfully met this objective.	None
	Measure 2	75%	93%	Students successfully met this objective.	None
Learning Outcome 3	Measure 1	70%	83%	Students successfully met this objective.	None
	Measure 2	75%	93%	Students successfully met this objective.	None
Learning Outcome 4	Measure 1	70%	88%	Students successfully met this objective.	None
	Measure 2	75%	93%	Students successfully met this objective.	None
Learning Outcome 5	Measure 1	70%	89%	Students successfully met this objective.	None
	Measure 2	75%	93%	Students successfully met this objective.	None
Learning Outcome 6	Measure 1	70%	90%	Students successfully met this objective.	None
	Measure 2	75%	93%	Students successfully met this objective.	None
Learning Outcome 7	Measure 1	70%	86%	Students successfully met this objective.	None
	Measure 2	75%	93%	Students successfully met this objective.	None

F. Evidence of Learning: MATH 3410/3420 Probability and Statistics ¹⁵				
Measurable Learning Outcome Students will...	Method of Measurement Direct and Indirect Measures*	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
1.A: Be able to compute continuous and discrete probabilities.	Question on homework, midterm, or final exam	MATH 3410 71% passed MATH 3420 % passed	Students successfully met this objective over the 70% threshold	None
	Course pass rate	MATH 3410 95.65% passed MATH 3420 100% passed	Students successfully met this objective over the 70% threshold	None
2.A: Be able to effectively analyze data.	Question on homework, midterm, or final exam	MATH 3410 % correct Not assessed MATH 3420 % passed	Students successfully met this objective over the 70% threshold	None
	Course pass rate	MATH 3410 95.65% passed MATH 3420 100% passed	Students successfully met this objective over the 70% threshold	None
3.A: Be able to construct a confidence interval.	Question on homework, midterm, or final exam	MATH 3410 69% correct MATH 3420 % correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	MATH 3410 95.65% passed MATH 3420 100% passed	Students successfully met this objective over the 70% threshold	None
4.A: Be able to construct and test a hypothesis.	Question on homework, midterm, or final exam	MATH 3410 85% correct MATH 3420 % correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	MATH 3410 95.65% passed MATH 3420 100% passed	Students successfully met this objective over the 70% threshold	None
5.A: Be familiar with regression.	Question on homework, midterm, or final exam	MATH 3410 79% correct MATH 3420 % correct	Students successfully met this objective over the 70% threshold	None
	Course pass rate	MATH 3410 95.65% passed MATH 3420 100% passed	Students successfully met this objective over the 70% threshold	None
6.A: Be introduced to analysis of variance, and related topics.	Question on homework, midterm, or final exam	MATH 3410 % correct Not assessed MATH 3420 % passed		Remind instructors to Assess it

¹⁵MATH 3410 and 3420 pass rates from Spring 2016 (201630)

F. Evidence of Learning: MATH 3410/3420 Probability and Statistics ¹⁵				
Measurable Learning Outcome	Method of Measurement	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Students will...	Direct and Indirect Measures*			
	Course pass rate	MATH 3410 95.65% passed MATH 3420 100% passed	Students successfully met this objective over the 70% threshold	None

*At least one measure per objective must be a direct measure; indirect measures may be used to supplement direct measure(s).

Math 3550, Introduction to Mathematical Modeling

1. Perform a dimensional analysis.
2. Be able to generate and use random numbers.
3. Be able to construct or work with a differential equation or discrete dynamical system model.
4. Construct a model application in business or in the biological, physical, or social sciences.

The direct measure (measure 1) for learning outcomes 1-3 were problems on the final exam and for the learning outcome 4 was two projects (one individual and one group). The indirect measure (measure 2) is the individual course passing rate*.

* Passing rate = (# of students with a course grade of "C" or better) / (# of students who completed the course)

Fall 2015 - Math 3550 (1 section, 19 students)					
Measurable Learning Outcome	Measure 1: Average Score	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
	Measure 2: Course Passing Rate				
Learning Outcome 1	Measure 1	75%	83%	Students successfully met this objective.	None
	Measure 2	80%	89%	Students successfully met this objective.	None
Learning Outcome 2	Measure 1	75%	84%	Students successfully met this objective.	None
	Measure 2	80%	89%	Students successfully met this objective.	None
Learning Outcome 3	Measure 1	75%	92%	Students successfully met this objective.	None
	Measure 2	80%	89%	Students successfully met this objective.	None
Learning Outcome 4	Measure 1	75%	82%	Students successfully met this objective.	None
	Measure 2	80%	89%	Students successfully met this objective.	None

G. Evidence of Learning: MATH 3610 Graph Theory ¹⁶¹⁷				
Measurable Learning Outcome Students will...	Method of Measurement Direct and Indirect Measures*	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
1.A: Explain basic definitions and properties associated with simple planar graphs, including isomorphism, connectivity, and Euler's formula, and describe the difference between Eulerian and Hamiltonian graphs.	Question on homework, midterm, or final exam	86% passed	Students successfully met this objective over the 70% threshold	None
	Course pass rate	100% passed	Students successfully met this objective over the 70% threshold	None
2.A: Describe and implement some of the graph algorithms, including finding a minimum weight spanning tree in a connected graph, finding a maximum matching and a maximum weight matching in a bipartite graph, and finding a Euler trail in a graph or digraph.	Question on homework, midterm, or final exam	83% passed	Students successfully met this objective over the 70% threshold	None
	Course pass rate	100% passed	Students successfully met this objective over the 70% threshold	None
3.A: Understand and apply some of the classical theorems of graph theory, including Kuratowski's theorem, Konig's theorem, Hall's theorem, Four Color theorem, Ramsey's theorem, and Tutte's theorem.	Question on homework, midterm, or final exam	84% passed	Students successfully met this objective over the 70% threshold	None
	Course pass rate	100% passed	Students successfully met this objective over the 70% threshold	None
4.A: Formulate short proofs using the following methods: direct proof, indirect proof, proof by contradiction, and case analysis.	Question on homework, midterm, or final exam	81% passed	Students successfully met this objective over the 70% threshold	None
	Course pass rate	100% passed	Students successfully met this objective over the 70% threshold	None

¹⁶ MATH 3610 offered fall semesters odd years.

¹⁷ MATH 3610 pass rate from Fall 2015 (201620)

H. Evidence of Learning: MATH 3620 Enumeration ¹⁸¹⁹				
Measurable Learning Outcome	Method of Measurement	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Students will...	Direct and Indirect Measures*			
1.A: Find recurrence relations for some sequences, and be able to apply generating-function methods to solve combinatorial problems.	Question on homework, midterm, or final exam	% passed	Measure 1: TBD	Measure 1: TBD
	Course pass rate	81.82% passed	Students successfully met this objective over the 70% threshold	None
2.A: Apply the Inclusion-Exclusion Principle to a variety of problems.	Question on homework, midterm, or final exam	% passed	Measure 1: TBD	Measure 1: TBD
	Course pass rate	81.82% passed	Students successfully met this objective over the 70% threshold	None
3.A: Advance their ability in reading and constructing proofs by using combinatorial methods.	Question on homework, midterm, or final exam	% passed	Measure 1: TBD	Measure 1: TBD
	Course pass rate	81.82% passed	Students successfully met this objective over the 70% threshold	None

*At least one measure per objective must be a direct measure; indirect measures may be used to supplement direct measure(s).

¹⁸ MATH 3620 offered spring semesters even years

¹⁹ MAHT 3620 pass rate from Spring 2016 (201630)

I. Evidence of Learning: MATH 4110/4120 Modern Algebra I/II ^{20 21}				
Measurable Learning Outcome Students will...	Method of Measurement Direct and Indirect Measures*	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
1.A: Clearly state and use definitions pertaining to group theory, ring theory, and field theory.	Question on homework, midterm, or final exam	MATH 4110 % passed MATH 4120 % passed	Students successfully met this objective over the 70% threshold	None
	Course pass rate	MATH 4110 100% passed MATH 4120 66.67% passed	Students successfully met this objective over the 70% threshold	Department Discussion Improve abstract thinking in Prerequisite courses
2.A: Write proofs of basic abstract facts regarding group theory, ring theory, and field theory.	Question on homework, midterm, or final exam	MATH 4110 % passed MATH 4120 % passed	Students successfully met this objective over the 70% threshold	None
	Question on homework, midterm, or final exam	MATH 4110 100% passed MATH 4120 66.67% passed	Students successfully met this objective over the 70% threshold	Department Discussion Improve abstract thinking in Prerequisite courses
3.A: Write mathematical solutions and proofs in a clear and concise manner.	Question on homework, midterm, or final exam	MATH 4110 % passed MATH 4120 % passed	Students successfully met this objective over the 70% threshold	None
	Course pass rate	MATH 4110 100% passed MATH 4120 66.67% passed	Students successfully met this objective over the 70% threshold	Department Discussion Improve abstract thinking in Prerequisite courses
4.A: Think critically and form conjectures related to group theory, ring theory, and field theory.	Question on homework, midterm, or final exam	MATH 4110 % passed MATH 4120 % passed	Students successfully met this objective over the 70% threshold	None
	Course pass rate	MATH 4110 100% passed MATH 4120 66.67% passed	Students successfully met this objective over the 70% threshold	Department Discussion Improve abstract thinking in Prerequisite courses
5.A: Use the fundamental theorems from group theory, ring theory, and field theory to prove additional theorems and better understand examples.	Question on homework, midterm, or final exam	MATH 4110 % passed MATH 4120 % passed	Students successfully met this objective over the 70% threshold	None
	Course pass rate	MATH 4110 100% passed MATH 4120 66.67% passed	Students successfully met this objective over the 70% threshold	Department Discussion Improve abstract thinking in Prerequisite courses

*At least one measure per objective must be a direct measure; indirect measures may be used to supplement direct measure(s).

²⁰ MATH 4110 offered fall semesters odd years and MATH 4210 offered spring semesters even years.

²¹ MATH 4110 pass rate from Fall 2015 (201620) and MATH 4210 pass rate from Spring 2016 (201630)

Evidence of Learning Mthe 4010 Capstone Mathematics for High School Teachers

A student who has successfully completed MTHE 4010 will have demonstrated proficiencies in understanding and being able to prove theorems for at least half of the following topics in mathematics designed for future high school teachers:

1. Real and complex numbers
2. Functions
3. Equations
4. Congruence
5. Similarity
6. Trigonometry

J. Evidence of Learning: MTHE 4010 Capstone Mathematics of High School Teachers ^{22 23}				
Measurable Learning Outcome Students will...	Method of Measurement Direct and Indirect Measures*	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
1.Topic: <u>Real and complex numbers</u>	Question on homework, midterm, or final exam	100% passed	Students successfully met this objective over the 75% threshold	None
	Course pass rate	100% passed	Students successfully met this objective over the 75% threshold	None
2.Topic: <u>Functions</u>	Question on homework, midterm, or final exam	93% passed	Students successfully met this objective over the 75% threshold	None
	Course pass rate	100% passed	Students successfully met this objective over the 75% threshold	None
3.Topic: <u>Equations</u>	Question on homework, midterm, or final exam	90% passed	Students successfully met this objective over the 75% threshold	None
	Course pass rate	100% passed	Students successfully met this objective over the 75% threshold	None
4. Topic: <u>Congruence</u>	Question on homework, midterm, or final exam	87% passed	Students successfully met this objective over the 75% threshold	None
	Course pass rate	100% passed	Students successfully met this objective over the 75% threshold	None
5. Topic: <u>Similarity</u>	Question on homework, midterm, or final exam	83% passed	Students successfully met this objective over the 75% threshold	None
	Course pass rate	100% passed	Students successfully met this objective over the 75% threshold	None
6. Topic: <u>Trigonometry</u>	Question on homework, midterm, or final exam	87% passed	Students successfully met this objective over the 75% threshold	None

²² MTHE 4010 offered fall semester.

²³ MTHE 4010 pass rate from Fall 2015 (201620)

J. Evidence of Learning: MTHE 4010 Capstone Mathematics of High School Teachers ^{22 23}				
Measurable Learning Outcome	Method of Measurement	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Students will...	Direct and Indirect Measures*			
	Course pass rate	100% passed	Students successfully met this objective over the 75% threshold	None

*At least one measure per objective must be a direct measure; indirect measures may be used to supplement direct measure(s).

b. Evidence of Learning: High Impact or Service Learning

This is an optional section. If you provide students with high impact or service learning opportunities you may briefly describe those opportunities and explain how you assess their impact on student learning. This [excerpt](#) from George D. Kuh provides a brief overview of high-impact practices.

Appendix A

Most departments or programs receive a number of recommendations from their Five-Year Program Review processes. This page provides a means of updating progress towards the recommendations the department/program is acting upon.

Date of Program Review: April 2013	Recommendation	Progress Description
Recommendation 1	Text of recommendation	Updated Fall2016
Hire more faculty	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.	<p>Update-July 2013 The department hired one additional tenure track faculty who started in July of 2013. This was a replacement for a faculty that left at the end of 2011-2012.A search for a Math Ed faculty took place to replace a retirement in that area.</p> <p>Update-Fall 2013 The department is currently performing a search for professor to fill a position vacated during 2012-2013 due to a retirement.</p> <p>Update-Spring 2014 The department performed a faculty search for a new tenure track position. Three of the top candidates had so many offers that they declined the on campus interviews. As we were in the process of making an offer to an excellent applicant he accepted an alternate position. When we wanted to make an offer to another extremely qualified applicant he was not approved by the Dean. No specific reasons for the action were given.</p> <p>Update-Fall 2014</p>

		<p>The department was recently authorized to make a search again this year. This time the position is open to an applicant specializing in Statistics.</p> <p>Update-July of 2015 There were only a few candidates for the faculty search of 2014/15. In spite of this a qualified faculty was hired, this was a replacement for a retired faculty.</p> <p>Update for Year 2015-2016 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. A new search is approved for 2016-2017.</p>
Recommendation 2	Text of recommendation	
Pursue Grants	<p>We also encourage the Department to pursue external funding opportunities, like the NSF's Noyce Grants, in order to build capacity. Writing such a large grant, particularly for the first time, is a serious, time-consuming activity, but the payoff is potentially very substantial. The College of Science should therefore consider making a small investment (in the form of faculty release time) to catalyze this process. The College should also consider bringing in consultants (for example, PIs on existing Noyce grants in Utah) to guide the Department's grant-writing activities.</p>	<p>Fall 2013 The Departmental Assessment Planning committee has been charged with locating grants opportunities that would be appropriate and accessible.</p> <p>Fall 2014 Nothing new to report.</p> <p>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.</p>

		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.
Recommendation 3	Text of recommendation	
Increase Advising	Increase personalized advising for the purpose of recruitment and retention. Consider hiring advanced undergrads for this purpose. Also consider hiring work-study students for some of the routine administrative tasks.	Spring 2013 The department chair began assigning a personalized faculty advisor/mentor to each newly declared math major.
Recommendation 4		Update-Summer and Fall 2013 A faculty mentor/advisor was assigned to each active current major. These lists have been posted in the Math Student Room. Post cards were also sent to each of these majors informing them of their faculty mentor and advising them to set up an appointment to see their advisor if they had questions. Spring 2014 and Fall 2014 All majors are being assigned faculty mentors. During spring 2014 the Math Club had a meet your mentor meeting. It went well. Update-Fall 2015 The department has been assigning faculty members as additional advisers/mentors to all new majors and current majors. The majors like having additional advising opportunities. The

		<p>Chair continues to make any exceptions to programs of study.</p> <p>Update for Year 2015-2016 Advisor assignments continue</p>
Pursue alternative approaches in Gateway courses	<p>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.</p>	<p>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.</p> <p>Fall 2014 Faculty are using and evaluating the new approaches.</p> <p>Fall 2015 Faculty continue to try alternative approaches to engage students. The success in getting students to read the material ahead of class has been low. Update for year 2015-2016 Faculty continue to try alternative approaches to engage students. The success in getting students to read the material ahead of class has been low in lower level courses.</p>
Recommendation 5		
Consider implementing uniform final exams and possibly uniform midterm exams in courses up to and including Calculus I with multiple-choice questions for some portion.	<p>Implementing uniform examinations is a simple (but high-impact) strategy with multiple benefits. Uniform examinations with common grading help ensure uniform standards. Common examinations promote cooperation among the faculty and provide savings</p>	<p>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.</p>

	<p>in time and effort. Instructors in courses with common exams are perceived more as a coach and mentor instead of a gatekeeper. The Department should consider using 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.</p>	<p>Fall 2014 This is still being considered but delayed due to moving to temporary quarters due to the construction of the new COS building.</p> <p>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.</p> <p>Update for year 2015-2016 Math 1210 and 1220 had common final exams in spring of 2016.</p>
Recommendation 6		
Mentor new faculty	Consider instituting appropriate procedures for the orientation of new contract/adjunct faculty.	In Fall 2014 the department adopted guidelines for mentoring new tenure track faculty. These are being followed.
Recommendation 7		
Rewrite Mission Statement and Strategic Plan	The Department would benefit from the development of a better strategic plan with clear priorities.	<p>Fall 2014 The Assessment /Planning Committee has been charged with this Task, but delayed due to the move to temporary quarters during the construction of the new COS building.</p> <p>Update for Year 2015-2016 A draft set of goals and a draft strategic plan were authored in Spring of 2016.</p>

Appendix B for 2015-2016

Please provide the following information about the full-time and adjunct faculty contracted by your department during the last academic year (summer through spring). Gathering this information each year will help with the headcount reporting that must be done for the final Five Year Program Review document that is shared with the State Board of Regents.

Faculty	
Headcount	
With Doctoral Degrees (Including MFA and other terminal degrees, as specified by the institution)	
Full-time Tenured	10
Full-time Non-Tenured (includes tenure-track)	4
Part-time	3
With Master's Degrees	
Full-time Tenured	1
Full-time Non-Tenured	
Part-time	10
With Bachelor's Degrees	
Full-time Tenured	
Full-time Non-tenured	
Part-time	18
Other	
Full-time Tenured	
Full-time Non-tenured	
Part-time	
Total Headcount Faculty	
Full-time Tenured	11
Full-time Non-tenured	4
Part-time	31

Please respond to the following questions.

- 1) Based on your program's assessment findings, what subsequent action will your program take?
 - 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 were lowered to Math Numeracy.
 - 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 programming 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, the starting place for Math degrees.
Action- An Associate's degree in Math was approved in 2015-2016.

- 2) We are interested in better understanding how departments/programs assess their graduating seniors. Please provide a short narrative describing the practices/curriculum in place for your department/program. Please include both direct and indirect measures employed.

We encourage our graduating students to complete our "Graduate Exit Survey". A copy of this is in our assessment plan. One question asks for their future plans and if they have a job lined up.

We will begin with Fall of 2016 to request that graduates join LinkedIn.