

Program Review - Academic - Mathematics Latest Version

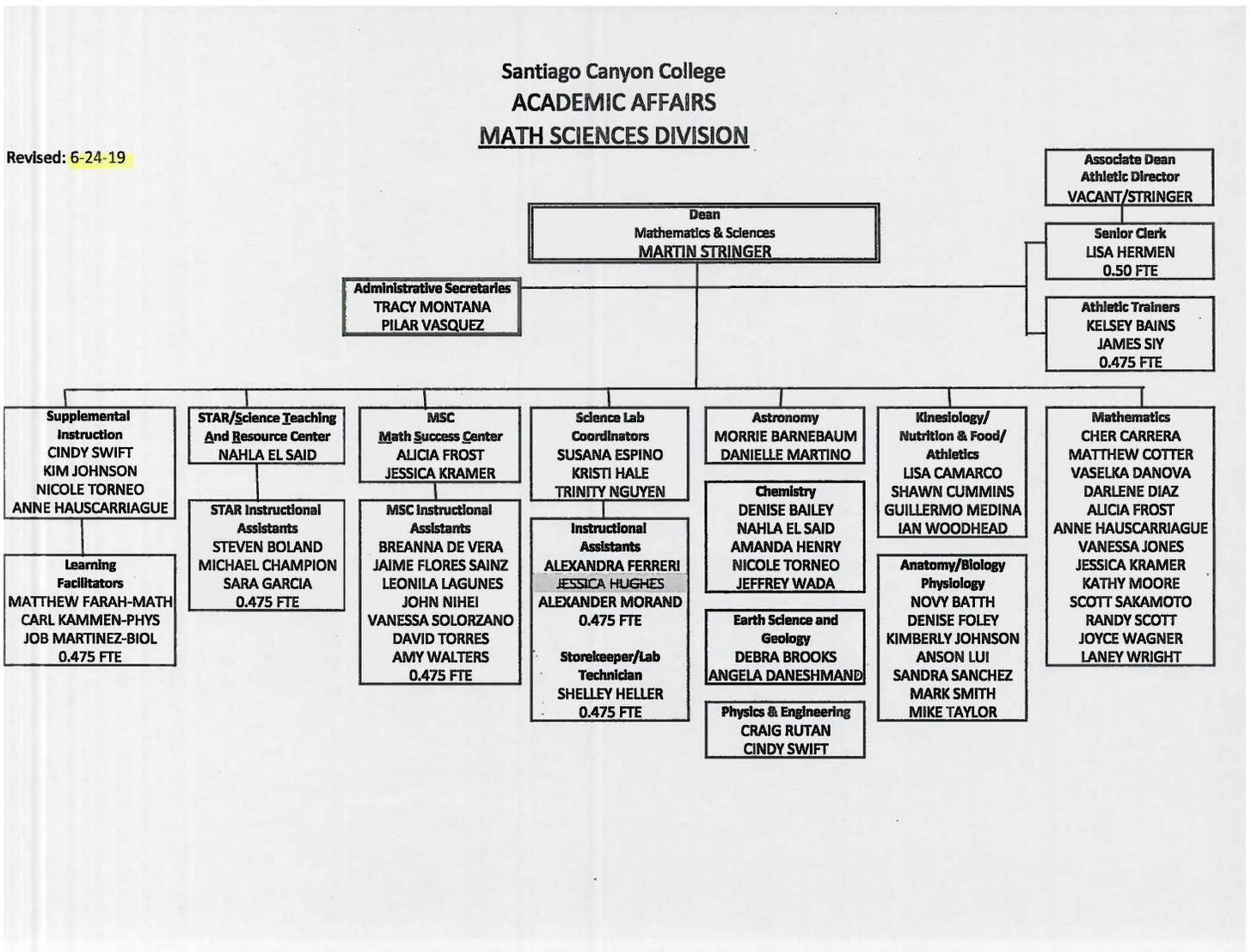
Overview

Program Review - Collaborators : Version by Sakamoto, Scott on 11/14/2019 14:43

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Program Review Overview - Organizational Chart : Version by Sakamoto, Scott on 11/14/2019 14:43

Please insert the organizational chart for this program or service area.



Careers requiring a mathematics background have grown exponentially. The outlook for jobs, such as STEM teacher, is good for filling new jobs and replacing vacated positions.

3. How do these projections affect planning for your program?

The SCC Math department has increased our transfer level Math offerings. We take part in STEM advisory, Pathways to Teaching STEM mentorship, STEM counselor visits, Community Science Night and STEM Day. Furthermore, we make every effort to meet both face-to-face and Distance Education demand for math classes. All of these activities promote the importance of a solid mathematics background. We also hire student workers to work for the math department in varying capacities.

Please provide comment on the rates of progress through the basic skills course sequence within your program using the California Community College Chancellor's Office Data Mart [Basic Skills Progress Tracker](http://datamart.cccco.edu/Outcomes/BasicSkills_Cohort_Tracker.aspx) (http://datamart.cccco.edu/Outcomes/BasicSkills_Cohort_Tracker.aspx).

As the number of levels below transfer increases, the successful completion of a transfer level course decreased. This is a statewide issue addressed with AB-705.

California Community College Chancellor's Office Basic Skills Progress Tracker Data
Spring 2016-Summer 2018

First Math class taken at SCC below transfer level	# of students	# of students to successfully complete a transfer level math course	% of students successful in transfer level course
3-below (N48)	107	15	14%
2-below (N60)	144	24	16.7%
1-below (070, 080)	168	51	30.4%

Please provide comment on student survey results administered by the program, if any.

N.A.

Please provide comment on program exit exams or other assessments of graduating students, if any.

N.A.

Please provide the number of students who take and pass external license examinations, if relevant to the program.

N.A.

Please provide data on former students' post-SCC experiences (e.g. transfer success, career advances, post-graduation surveys), if any.

N.A.

Please provide data pertaining to the instruction or delivery of service, if any.

N.A.

Outcomes Assessment

Program Review Outcomes Assessment - Course and Section Count : Version by Sakamoto, Scott on 11/22/2019 19:55

Courses	Section Count
MATH070 - Geometry	2
MATH070L - Geometry Math Lab	2
MATH080 - Intermediate Algebra	32
MATH080 - Intermediate Algebra	11
MATH080L - Intermediate Algebra Math Lab	3
MATH086 - Intermediate Algebra for Statistics and Liberal Arts	20
MATH086 - Intermediate Algebra for Statistics and Liberal Arts	7
MATH086L - Intermediate Algebra for Statistics and Liberal Arts Math Lab	3
MATH105 - Mathematics for Liberal Arts Students	12
MATH105 - Mathematics for Liberal Arts Students	6
MATH105L - Mathematics for Liberal Arts Students Math Lab	3
MATH140 - College Algebra	17
MATH140 - College Algebra	7
MATH140L - College Algebra Math Lab	3
MATH150 - Calculus for Biological, Management and Social Sciences	9
MATH150 - Calculus for Biological, Management and Social Sciences	4
MATH150L - Calculus for Biological, Management and Social Sciences Math Lab	3
MATH160 - Trigonometry	13
MATH160 - Trigonometry	5
MATH160L - Trigonometry Math Lab	3
MATH170 - Pre-Calculus Mathematics	6
MATH170 - Pre-Calculus Mathematics	12
MATH170L - Pre-Calculus Mathematics Math Lab	3
MATH180 - Single Variable Calculus I	13
MATH180 - Single Variable Calculus I	6
MATH180H - Honors Single Variable Calculus I	1
MATH185 - Single Variable Calculus II	4
MATH185 - Single Variable Calculus II	9
MATH185L - Single Variable Calculus II Math Lab	3
MATH203 - Fundamental Concepts of Elementary Mathematics	1

Courses	Section Count
MATH203 - Fundamental Concepts of Elementary Mathematics	2
MATH203L - Fundamental Concepts of Elementary Mathematics Math Lab	2
MATH219 - Statistics and Probability	14
MATH219 - Statistics and Probability	34
MATH219H - Honors Statistics and Probability	1
MATH219H - Honors Statistics and Probability	1
MATH219L - Statistics and Probability Math Lab	3
MATH280 - Intermediate Calculus	2
MATH280 - Intermediate Calculus	5
MATH280L - Intermediate Calculus Math Lab	2
MATH290 - Linear Algebra	1
MATH290 - Linear Algebra	2
MATH290L - Linear Algebra Math Lab	2
MATH295 - Differential Equations	1
MATH295 - Differential Equations	2
MATH295L - Differential Equations Math Lab	1
MATHN06 - Essential Mathematics	2
MATHN48 - Pre-Algebra/Algebra Basics	7
MATHN48 - Pre-Algebra/Algebra Basics	2
MATHN48L - Pre-Algebra/Algebra Basics Math Lab	2
MATHN55 - Beginning Algebra	2
MATHN55L - Beginning Algebra Math Lab	1
MATHN60 - Elementary Algebra	14
MATHN60 - Elementary Algebra	2
MATHN60L - Elementary Algebra Math Lab	3
MATHN73L - Math Review	4
MATHN73L - Math Review	1
MATHN98A - Precalculus Support Course	1
MATHN98A - Precalculus Support Course	1
MATHN98B - Intermediate Algebra Support Lab	2
MATHN98B - Intermediate Algebra Support Lab	3
MATHN98C - Statistics Support Course	2
MATHN98C - Statistics Support Course	2

Program Review Outcomes Assessment - CSLOs : Version by Sakamoto, Scott on 11/26/2019 15:01

Student Learning Outcomes	CSLO Count	CSLOs Measured
MATH080 - Intermediate Algebra	3 3	
Identify different types of equations and solve them by applying the appropriate algebraic methods.		
Solve applications involving different types of functions and/or equations by applying the appropriate solving techniques.		
Graph equations, functions, and conics by applying different graphing techniques and transformations.		
MATH086 - Intermediate Algebra for Statistics and Liberal Arts	2 2	
Solve an application problem by constructing a mathematical model and interpret the results in context of the problem.		
Solve various types of equations by applying the appropriate method.		
MATH105 - Mathematics for Liberal Arts Students	2 2	
Recognize mathematical applications in everyday life and demonstrate appropriate, relevant problem-solving skills.		
Locate and utilize mathematical resources and technology while demonstrating numerical reasoning and literacy.		

Student Learning Outcomes	CSLO Count	CSLOs Measured
MATH140 - College Algebra	2 2	
Apply algebraic, numerical, and graphical processes to manipulate and analyze equations, inequalities, and functional relationships.		
Formulate and analyze mathematical models for a variety of real-world phenomena and use mathematical and technological tools to determine the veracity of the model.		
MATH150 - Calculus for Biological, Management and Social Sciences	3 3	
Apply appropriate problem-solving techniques, including critical thinking and analytical reasoning, to model real world problems in the fields of Business, Economics, Social Sciences and Biology.		
Formulate problems in numerical, graphical, verbal, and analytical settings and use differentiation and integration techniques of single- and multi-variable calculus to analyze those problems.		
Interpret and communicate mathematical results in a clear, accurate and professional manner.		
MATH160 - Trigonometry	3 3	
Analyze, sketch and apply the six trigonometric functions and polar equations using such principles as asymptotic, periodic, and reciprocal behavior, as well as plotting points generated by a table or by using technology.		
Model, evaluate and solve equations and real-world problems using inverse functions, Law of Sines, Law of Cosines, algebraic techniques, and technology.		
State, verify and apply trigonometric identities, including but not limited to reciprocal, co-functional and Pythagorean identities, sum and difference identities, double- and half-angle identities.		
MATH170 - Pre-Calculus Mathematics	2 2	
Use algebraic, numerical, and graphical processes to manipulate and analyze equations, inequalities, and functional relationships.		
Formulate and analyze mathematical models for a variety of real-world phenomenon and use mathematical and technological tools to determine the veracity of the model.		
MATH180 - Single Variable Calculus I	2 2	
Analyze functions and their graphs using limits, derivatives, definite and indefinite integrals.		
Apply basic definitions, properties and theorems of first semester Calculus to formulate elementary proofs and model and solve problems.		
MATH185 - Single Variable Calculus II	2 2	
Evaluate and approximate integrals using a variety of techniques and apply integration to solve problems involving area, volume, work, and differential equations.		
Represent functions using parametric equations, polar equations, and Taylor series and apply calculus techniques to these representations.		
MATH203 - Fundamental Concepts of Elementary Mathematics	3 3	
Analyze the structure and properties of rational and real number systems including their decimal representation and illustrate the use of a representation of these numbers including the number line model.		
Evaluate the equivalence of numeric algorithms and explain the advantages and disadvantages of equivalent algorithms.		

Student Learning Outcomes	CSLO Count	CSLOs Measured
Analyze multiple approaches to solving problems from elementary to advanced levels of mathematics, using concepts and tools from sets, logic, functions, number theory and patterns.		
MATH219 - Statistics and Probability	3	3
Analyze the validity of statistical statements by evaluating the statistical methods applied on collected data.		
Represent data from a sample or population in an organized and visual manner.		
Interpret data represented in a chart or graph in context of the scenario.		
MATH280 - Intermediate Calculus	3	3
State and apply basic definitions, properties and theorems of multivariable Calculus		
Apply vector operations in two and three dimensions and use vector methods to analyze plane and space curves, and curvilinear motion.		
Apply standard techniques of multivariable differentiation and integration to solve application problems		
MATH290 - Linear Algebra	4	4
State and apply basic definitions, properties and theorems of linear algebra		
Perform operations on matrices in order to solve systems of linear equations, analyze linear transformations and apply matrix theory to model real-life situations		
Identify vector spaces, apply properties and utilize concepts of vector spaces.		
Compose clear and accurate proofs using the concepts of this course.		
MATH295 - Differential Equations	4	4
Demonstrate the ability to communicate basic definitions, properties, and theorems of beginning differential equations.		
Apply various methods to solve the vast array of differential equations encountered in beginning differential equations.		
Demonstrate logical reasoning processes in identifying, modeling, and solving problems.		
Use the principles of beginning differential equations to apply problem-solving strategies to real-world situations.		
MATHN48 - Pre-Algebra/Algebra Basics	4	4
Recognize and apply algebraic vocabulary and symbols.		
Perform algebraic operations on polynomials.		
Model real-world problems with appropriate mathematical notation and interpret the solutions in context of the problem.		
Solve linear equations and apply the relationship between solutions of linear of equations in two variables and their graphs.		
MATHN60 - Elementary Algebra	3	3
Evaluate and perform algebraic operations on polynomial, rational and radical expressions.		
Solve word problems and equations involving linear, quadratic and rational expressions using appropriate algebraic techniques.		
Manipulate and analyze linear equations including finding slope, intercepts, graph and equation.		
MATHN98A - Precalculus Support Course	2	0
Manipulate expressions and solve equations using concepts in algebra and trigonometry.		
Analyze functions graphically and algebraically.		
MATHN98B - Intermediate Algebra Support Lab	3	0

Student Learning Outcomes	CSLO Count	CSLOs Measured
Simplify expression and solve equations as detailed in the Math 080 course content.		
Identify key concepts in application problems.		
Use key concepts to solve application problems as detailed in the Math 080 course content.		
MATHN98C - Statistics Support Course	2	0
Formulate questions that can be addressed with data, then organize, summarize, analyze, and apply mathematical reasoning to communicate results with and without technology.		
Construct, apply, and interpret mathematical models to represent and communicate relationships in quantitative data.		
MATH219H - Honors Statistics and Probability	3	3
Analyze the validity of statistical statements by evaluating the statistical methods applied on collected data.		
Represent data from a sample or population in an organized and visual manner.		
Interpret data represented in a chart or graph in context of the scenario.		
MATHN73L - Math Review	2	2
Classify and identify different problem types and select suitable problem solving techniques.		
Model and solve class appropriate applications in a clear, organized and professional manner.		

Program Review Outcomes Assessment - PSLOs : Version by Sakamoto, Scott on 11/14/2019 14:43

Program Student Learning Outcomes	PSLO Count	PSLOs Measured
Mathematics*		
Mathematics	3	3

Program Review Outcomes Assessment - Assessment of CSLOs and PSLOs : Version by Sakamoto, Scott on 11/14/2019 14:43

How does the program/service area systematically assess student learning outcomes and/or service area outcomes using specific and measurable performance criteria?

The SCC Math department uses embedded questions for SLO assessment. A Likert scale system is used where the top two or three scores generally represent successful completion of the assessment item. Data are gathered each semester, analyzed and reported prior to week 5 of the following semester. Recommendations are implemented as soon as possible following reports. Reports are also made available to faculty and others via the SCC public H-drive.

What is your assessment cycle, how are assessments carried out, and who is involved in the assessment process?

Each course has 2-4 SLOs and each SLO is assessed at least once every three years. Individual course coordinators are responsible for the SLO process. Embedded questions are used to gather CSLO data.

Upon review of course student learning outcome assessment data, give at least one specific example of:

1. A course student learning outcome which students have definitely met and why you think students were successful.
2. A course student learning outcome which students have definitely **not** met and why you think students were unsuccessful. What changes have you considered making?

1. A course student learning outcome which students have definitely met and why you think students were successful.

In Math 185, SLO 1 reads, "Evaluate and approximate integrals using a variety of techniques and apply integration to solve problems involving area, volume, work, and differential equations" and data were gathered in Summer and Fall 2017. For this SLO, a 4-point scale was used and scores of 2, 3 or 4 were considered successful. Eighty-four percent of students were successful and the SLO was definitely met. Math 185 is a challenging course, but the SCC Math department does its best to prepare students. Math 185 students are generally, hard workers, well-prepared and well-informed. Success in the college level STEM pathway courses is not unusual.

2. A course student learning outcome which students have definitely **not** met and why you think students were unsuccessful. What changes have you considered making?

In Math 140, SLO 2 reads, "Formulate and analyze mathematical models for a variety of real-world phenomenon and use mathematical and technological tools to determine the veracity of the model" and data were reported in the 2017/2018 academic year. Again, a 4-point scale was used with 2, 3 or 4 points considered successful. For this assessment, 57% of assessment items were scored as successful resulting in the SLO not being met. In this case, a rather broad SLO is in use. College Algebra requires a lot of knowledge from previous coursework and it is difficult for students to remember earlier algebra as well as learn more advanced concepts. Although, we do not have support courses for Math 140 at this time, we will be allowing Math 140 students to enroll in support courses for Math 080. Perhaps this will bridge some of that knowledge gap.

What changes has the program **already** made based on its assessment of course student learning outcomes? Give specific examples and describe how you know if the changes have increased success?

- The MSC is now non-credit (and thus free) and we hope this makes the MSC more accessible. We do not have the ability to determine the effects of this move yet since the change occurred in 2019.
- When facilities, funds, etc. allow, we target specific courses with SI. When we look at SI data, it is noticeable that students who attend SI three or more times in a semester are more successful.
- When SLO assessment was introduced, math coordinators used varying assessment tools. Although, there are still some inconsistencies, we have standardized embedded questions and Likert scale scoring. Simply viewing success rates for SLOs overtime could indicate the positive influences of these changes.
- In response to AB-705, we are introducing support courses and experimenting with delivery methods in an attempt to find the most effective model for SCC students.

Upon review of *program student learning outcome assessment data*, what patterns, trends, or anomalies did your program identify?

Mathematics PSLOs:

PSLO1: Create mathematical models of real world phenomena, apply those models to make predictions about the behavior of the phenomena, apply appropriate problem solving techniques, and critically evaluate the veracity of the obtained results.

PSLO 2: Clearly communicate their mathematical reasoning and problem solving skills using a variety of formats, diverse technologies, and appropriate mathematical vocabulary and notation.

PSLO 3: Integrate into educational and professional conduct a calm, confident, and ethical approach to mathematical reasoning and problem solving while taking personal responsibility for mathematical successes

The 2017/2018 data gathered from capstone classes (Math 290 and Math 295) illustrates that 85% of 106 students met standards for success on assessment items. This success gives evidence that students completing the math sequence at SCC have the ability to mathematically model, communicate, and problem solve. These are some of the main abilities outlined in PSLO 1, 2, and 3 for the Mathematics department.