LMC Program Review Year 3 Update 2019-2020
Instructional Unit Name: Mathematics (Transfer)

Introduction

In 2017-2018, all departments/programs completed a Comprehensive Program Review (CPR), in which goals were set for the 2017-2022 program years. Los Medanos College (College) is now in year three of a five-year review cycle. New to this program review cycle is the passage of the State's _Vision for Success_ plan which establishes system-wide goals that can only be attained by each department contributing to college-level goals aligned with the state plan. Toward that end, the _Contra Costa Community College District Strategic Plan_ (_CCCD Strategic Plan_) adopted by the Governing Board at its June 2019, meeting, aligns with the _Vision for Success_ and plans are underway to ensure that the _Los Medanos College Educational Master Plan (LMC EMP)_ also supports college and state goals. The intent is to direct College efforts toward a singular and coordinated set of goals.

The _Vision for Success_ directs each college to increase degree and certificate completion and increase student transfers, improve time to completion, increase job placement in field of study, narrow achievement gaps and establishes targeted goals in five primary areas as follows:

Goal #1 Increase by 20 percent the number of CCC students annually who acquire associates degrees, credentials, certificates, or specific skill sets that prepare them for an in-demand job.

Goal #2 Increase by 35 percent the number of CCC students' system-wide transferring annually to a UC or CSU.

GOAL #3 Decrease the average number of units accumulated by CCC students earning associate's degrees, from approximately 87 total units (the most recent system-wide average) to 79 total units—the average among the quintile of colleges showing the strongest performance on this measure

GOAL #4 Increase the percent of exiting CTE students who report being employed in their field of study, from the most recent statewide average of 69 percent to an improved rate of 76 percent—the average among the quintile of colleges showing the strongest performance on this measure in the most recent administration of the CTE Outcomes Survey.

Goal #5 Reduce equity gaps across all of the above measure through faster improvements among traditionally underrepresented groups as identified by the college.

The College can only meet its local and state goals with the contribution of each department's efforts. As noted, the intent is to direct College efforts towards a singular and coordinated set of goals to garner greater efficiencies and avoid duplication of effort.

The *Program Review Year 3* Update includes five components with specified timeframes (not in chronological order) for draft and completion:

Item 1. Program Update (October 1 – October 31)
Provide an update to the department's 2017-18 CPR

Item 2. Setting the Vision for Success Goals 2021-22 (November 1 – November 27)
Department/program alignment of goals, action steps, timeline, responsible party and next steps – all tied to the *Vision for Success* indicators. For ease of reference, the *Vision for Success* indicators are included in this section.

Item 3. Assessment Date and Effectiveness (August 26 – September 30)
Status report on the review and assessment of courses and next steps

Item 4. Course Outline Updates (August 26 – September 30)
Status report on the review and assessment of Course Outline of Records and next steps

Item 5. Resource Needs (February 1 – February 28)
Resource needs to meet goals, if any.

The table below shows a list of the above components in chronological order. The intent is to complete sections of Program Review by these dates to better assess and inform the process.

Date	Program Review Update Component
August 26 – September 30	**Item 3.** Assessment Date and Effectiveness Status report on the review and assessment of courses and next steps.
August 26 – September 30	**Item 4.** Status report on the review and assessment of Course Outline of Records and next steps.
October 1 – October 31	**Item 1.** Provide an update to the department's 2017-18 CPR
November 1 – November 27	**Item 2.** Department/program alignment of goals, action steps, timeline, responsible party and next steps – aligned with the *Vision for Success* indicators.
February 1 – February 8	**Item 5.** Resource Needs

1. Program Update (Oct 1 – Oct 31)

1a. Provide any important changes or updates within your program since your last CPR. (New degrees, new curriculum, staffing changes, etc.)

Staffing Changes:

Since Fall 2017 the department has hired four tenured-track faculty. Of the new tenured-track faculty two are statistics specialist and two are generalist.

New curriculum:

In Spring 2019 the department introduced statistics curriculum that aligns with PSLOs and CSLOs. The new curriculum is a low cost option to the previously used textbook.

Important Changes

Since Fall 2017 the department has opened access to applied calculus and pre-calculus. Starting in Fall 2019, students who have not completed intermediate algebra and wish to complete applied calculus or pre-calculus can enroll in intermediate algebra support course concurrently. This change allows students to complete these transfer level courses in one semester.

1b. Please address the following enrollment data provided for your program.

1.b.1. What are the enrollment trends over the past 3 years, beginning with Fall 2017? (Please address census enrollment, census fill rate, and productivity (Ftes/Ftef)

Census enrollment: From Fall 2017 to Fall 2019 census enrollment has increased by 8.9% (from 2032 to 2213). Census enrollment is lower in Spring compared to Fall for each academic year. Census fill rate in the program has fluctuated from a low of 82.6% in Spring 2018 to 96.4% in Fall 2018. The average productivity in the program between Fall 2017 and Fall 2019 was 16.7 compared to the average LMC productivity of 15.7 during the same time. Productivity in the department has fluctuated from 14.8 in Spring 2018 to 18.4 in Fall 2018.

Term	Census Enrollment	Census Fill Rate	LMC Census Fill Rate	Ftes/Ftef	LMC Ftes/Ftef
2017FA	2,032	89.00%	66.4%	15.9	15.6
2018SP	1,756	82.60%	60.7%	14.8	15
2018FA	2,110	96.40%	68.2%	18.4	16.3
2019SP	1,802	86.00%	62.3%	16.5	15.3
2019FA	2,213	93.00%	68.5%	17.9	16.5

Census enrollment in gateway courses:

Math 110 (previously Math 34)

Term	Census Enrollment	Census Fill rate	LMC Census Fill Rate	Ftes/Ftef	LMC Ftes/Ftef
2017FA	673	100.10%	66.4%	17.5	15.6
2018SP	553	97.00%	60.7%	16.7	15
2018FA	815	106.10%	68.2%	20	16.3
2019SP	653	92.80%	62.3%	17.5	15.3
2019FA	929	96.80%	68.5%	18.2	16.5

Enrollment in Math 110 (previously Math 34) has increased by 27.5% from Fall 2017 to Fall 2019. In Math 110 census enrollment is lower in Spring compared to Fall for each academic year. Enrollment in this gateway course spans from a low of 553 in Spring 2018 to a high of 929 in Fall 2019. Census fill rates have fluctuated between 92.8% in Spring 2019 to a high of 106.1% in Fall 2018, with an average census fill rate of 98.56%. The average productivity (Ftes/Ftef) in Math 110 between Fall 2017 and Fall 2019 was 17.98 which is higher than the LMC average of 15.7.

Math 155-Precalculus (previously Math 40)

Term	Census Enrollment	Census Fill Rate	LMC Census Fill Rate	Ftes/Ftef	LMC Ftes/Ftef
2017FA	152	95.00%	66.4%	16.6	15.6
2018SP	116	72.50%	60.7%	12.6	15
2018FA	143	111.70%	68.2%	21.1	16.3
2019SP	132	82.50%	62.3%	15.6	15.3
2019FA	166	103.80%	68.5%	19.6	16.5

Enrollment in Math 155 (previously Math 40) fluctuated between 116, in Fall 2018 to 166, in Fall 2019. In Fall 2019 the department introduced Math 155s (intermediate algebra support for pre-calculus). The average census fill rates between Fall 2017 and Fall 2019 was 95.26%, with a low of 72.5% in Spring 2018 and a high of 111.7% in Fall 2018. The productivity in Math 155 fluctuated from a low of 12.6% in Spring 2018 to a high of 21.1 in Fall 2018. The average productivity from Fall 2017 to Fall 2019 was 17.1 compared to the LMC average of 15.7.

Term	Census Enrollment	Census Fill Rate	LMC Census Fill Rate	Ftes/Ftef	LMC Ftes/Ftef
2017FA	109	100.90%	66.4%	19.8	15.6
2018SP	127	88.20%	60.7%	17.3	15
2018FA	110	101.90%	68.2%	21.6	16.3

| 2019SP | 125 | 86.80% | 62.3% | 18.2 | 15.3 |
| 2019FA | 160 | 111.10% | 68.5% | 23.5 | 16.5 |

Math 210 (previously Math 50)

Census enrollment in Math 210 increased by 46% from Fall 2017 (109) to Fall 2019 (160), with an average census enrollment of 126 students. Census fill rates have fluctuated between 86.8% in Spring 2019 to 111.1% in Fall 2019. The average productivity for Math 210 between Fall 2017 and Fall 2019 was 20.08 with a low of 17.3 in Spring 2018.

1.b.2. What does the data suggest in terms of future needs/directions?

The enrollment trends in the gateway courses (Math 110,Math 155 and Math 210) suggest that there is a need for the department to support professional development. Teaching communities and order pairs mentorship need to be expanded to include faculty teaching in the calculus pipeline. Productivity trends suggest the department needs an increase in FTEF. Further, the census fill rates suggest that course offerings must be increased.

1c. Provide a brief update of your program's goals as listed in your **(CPR)** 2017- 2018. Given these goals, please provide a brief update on: (a) Goals completed since their submission in 2018, and the impact of that completion on program effectiveness; (b) Goals abandoned with an explanation of why they were abandoned and (c) Goals still in progress or modified to be achieved by 2021-2022.   Please include action steps, timeline, and responsible parties.

Goals	Completed/ Abandoned/ In Progress/ Modified	Impact/ Explain/ Action Steps	Timeline/ Responsible Parties
Goal 1: **Adequately staff the math department with full time faculty so that fifty percent of courses are taught by full time faculty.**	In progress	We are having an increasingly difficult time finding part-timers who are qualified and competent. Every semester we must either offer variances or sections to instructors we have previously decided not to give sections to. Our chair and deans spend a disproportionate amount of time dealing with student complaints due to part-time faculty. Our only alternative is to cancel classes for lack of professors. Further, Increasing the number of full-time professors will support our continued efforts to improve the overall quality of teaching in our courses. Our adjunct faculty are limited with respect to time and resources, making it difficult for them to participate in activities such as	Fall 2021 Department Chair Box 2A request Management

		department-wide learning outcome assessments and staff development. Adjunct faculty also have less time to gain institutional knowledge that we use to support students in navigating the college. Increasing the number of full-time faculty also means increased ability to support our math lab in terms of tutor training. Over the past two years the department has hired four tenured-track faculty members. The following table represents the proportion of courses taught by full-time faculty members:	

Term	Percent of unit load taught by full-time faculty
Fall 2017	31.9% (95/297)
Spring 2018	38.9% (102/262)
Fall 2018	36.4% (105/288)
Spring 2019	42.8% (111/259)
Fall 2019	42.3% (125/295)

Semester	Percent of courses taught by full-time faculty
Fall 2017	35.7% (25/70)
Spring 2018	40% (26/65)
Fall 2018	38.8% (26/67)
Spring 2019	45.2% (28/62)
Fall 2019	46.6% (34/73)

Goal 2: **Develop and expand our accelerated offerings through focused leadership, including student recruitment, curriculum, and professional development**	In progress	In Fall of 2017 the department offered six sections of our Math 110s (algebra support) for statistics, this amount has now increased by 150%. In Fall 2019 the department is offering ten sections of Math 110/110s. There is a statistics teaching community, which has developed and implemented pedagogy and curriculum which aligns with CSLOs and PSLOs. New tenure-track faculty members have been instrumental in the implementation of these professional development opportunities. With the expansion of co-requisite courses professional development is needed to share best practices and develop effective classroom pedagogy and course curriculum. Department faculty have taken an active approach of recruiting students to accelerated courses through classroom presentations during student registration periods. These visits allow for students to hear from faculty the manner	Fall 2021 Math Department

		in which these accelerated classes are taught; get an overview of the course content and clarify their path to completing transfer level math courses. The department will expand its recruiting efforts to include presentations regarding Math 140/140s and Math 155/155s for the next two years. For the college to meet its goal of decreasing the average number of units accumulated by LMC students, it is important for students learn about their options for transfer level courses in the wake of AB705. To address the changes due to AB705 the department will need funding to develop teaching communities of full-time and adjunct faculty which focus on creating and implementing pedagogy and curriculum that align with CSLOs/PSLOs and who are low cost or zero cost to students.	
Goal 3: **Design and implement a programmatic effort to support under-served students, including but not limited to students of color and low income students; coordinate our effort with other campus projects.**	**In progress**	Through placement reform and the adaption of multiple measures placement access to transfer level courses has increased. Through these efforts more under-served students achieved access to gateway courses. The department has expanded its offerings of online and hybrid sections to serve working students. The department has coordinated with Transfer Academy to offer sections of Math 110. Faculty teaching Transfer Academy sections participate in professional development and collaborate with program counselors and program leads to support Transfer Academy students. Math faculty have participated in Transfer Academy welcome day and have provided tutoring and extra support for students in Transfer Academy. During flex week faculty participate in Professional development through the collaboration with UMOJA faculty to address student's needs for the upcoming semester. Faculty have worked to develop study skills and address affective domain skills to improve Math 110 course completion. Further, department faculty have been involved in mentorship of UMOJA scholars and dedicated tutoring hours in UMOJA village. Faculty in the department continue to participate in outreach efforts to support under-served students, Math 220 faculty have held office hours in the MESA center and serve as advisors for SACNAS. Future plans include offering a Math 210 section for MESA and S-STEM students. Faculty	Fall 2021 Math Department Math Department Chair

		will collaborate with MESA directors and MESA counselors to support under-served students in the STEM pipeline.	
Goal 4: **Improve departmental use of data from lab/tutoring assessment research, including but not limited to training for student tutors and faculty tutoring in the math lab.**	In progress	Math Lab coordinators have used responses from Math Lab surveys, evaluations and course trends to increase the number of student tutors who tutor Statistics. Training of student tutors has been expanded to include tutor training via canvas modules and training tutors to use the Socratic method. The department has started to shift instructional technology away from graphing calculators towards StatCrunch, that Math Lab has provided StatCrunch training for incoming tutors and faculty. The department will be implementing supplemental instruction and will revert MA-109 to a dedicated supplemental instruction room.	Math Department Math Department chair
Goal 5: **Design and implement professional development in the form of teaching communities and ordered pairs mentoring for faculty teaching transfer level mathematics**	In Progress	Math 110 has ongoing professional development to address pedagogy and curriculum development. The department has led teaching communities for faculty teaching Math 140s and 155s, it will need to expand to include faculty who will like to teach courses in the future. Funding will be required to support ordered pairs in the next semesters. The expansion of co-requisite courses will make it necessary for more faculty to teach these courses. Non-evaluation classroom observations and teaching communities focused on teaching to course objectives will be needed in order to adequately support faculty and maintain high teaching standards. Calculus 1 was identified as the key attrition point within the LMC STEM pipeline. Effective pedagogy in the form of active learning has been identified as an effective strategy to increasing student understanding, engagement and problem solving. Teaching communities have been identified as a key component to influencing teaching culture and pedagogy needed to implement this change. Beyond these co-requisite courses, the department also has plans to provide mentoring for faculty who teach in the Calculus pipeline.	Fall 2020 Math Department Chair Math Department
Goal 6:	In-Progress	From past course assessment there is an identified need for curriculum and professional development around Math 26 (Geometry) and Math 155	Fall 2020 Math department chair

Redesign Geometry and Precalculus (trigonometry) preparation for calculus		(Precalculus), especially in the area of Trigonometry. The Math 26 COOR is being updated to include more of an emphasis on Trigonometry.	Math path to transfer committee
Goal 7: **Transform our use of instructional technology, with a potential shift away from calculators to computer/app based options**	In progress	One of the major transformations to instructional technology in the past two years has been the shift towards computer software (e.g. StatCrunch) and away from calculators. Further, web applications such as ShinyApps and Desmos are being used to support instruction. Precalculus and Calculus courses rely on Mathematica, Geogebra and Desmos to create models and graphics. These tools are necessary to teaching our courses to the course outlines and meeting PSLOs. To meet this goal the department needs to increase professional development opportunities in which faculty can share current uses of technologies. Professional development is needed to develop and share effective teaching practices with Canvas.	Fall 2021 Math department chair Math path to transfer committee
Goal 8: **Have appropriate facilities resources to appropriately teach to our course outlines**	In progress	Thanks to the Transformation Grant the department has access to sixty tablets. These tablets have become crucial for faculty teaching in non-computer classrooms. Precalculus, Applied Calculus, Statistics and Calculus courses are increasingly relying on computer software to process models, which the graphing calculator cannot support. Additional computer classrooms would further support transfer level mathematics students in completing computer based work, software based assignments and class projects. It is important for the college to continue to invest in facility resources, as finding classrooms to host these courses is becoming more difficult.	2021 LMC Management

For CTE programs only:

1c.   Community and Labor Market Needs (Link Ed Code 78016, Title 5, 51022)

1d.   Advisory Board Update and Analysis (CTE related only) Include dates of Advisory Board meetings in 2018-2019, and those completed or planned in 2019-2020.

2. Setting Vision for Success Goals for 2021-22 (Nov 1—Nov 27)

The *Vision for Success* directs each college to increase degree and certificate completion and increase student transfers, improve time to completion, increase job placement in field of study, narrow achievement gaps and establishes targeted goals in five primary areas. The College can only meet its local and state goals with the contribution of each department's efforts. As noted, the intent is to direct College efforts towards a singular and coordinated set of goals to garner greater efficiencies and avoid duplication of effort.

2a. The following table lists the *Vision for Success* indicators that we must align to as a college and as a district. Please look at your program data (Tableau) for each of the following *Vision for Success* indicators. Please address all indicators that are relevant to your program, set your program goal, indicate the action steps, timeline and responsible parties to achieve program goals.

Vision for Success Indicators and ACCJC Indicator	Program Set Goals for 2021-2022	Action Steps	Timeline	Responsible Parties	Notes
Course Success	64.5%	The department will expand professional development to gateway courses (Math 110, 120, 140, 155 and 210) Design and offer teaching community with a focus on developing affective skills, metacognition and creating meaningful contextualized learning experiences. Use of supplemental instruction to students in Math 110, Math 140 and Math 155.	Fall 2021	Math Department Faculty, Math Department Chair	
Degrees (AA, AS, ADT)	AS- 2 AST- 15	Re-new professional development for faculty teaching in STEM pipeline		Math Faculty, Math Department Chair	

		Collaborate with MESA coordinator and MESA counselors to inform students regarding AS and AST degree. Collaborate with Faculty teaching Math 250 and 230 to advertise Math AA to students.			
Certificates of Achievement					
Unit Reduction					
CTE Jobs					

2b. The Vision for Success Goal 5—Equity. The College has identified three disproportionately impacted (DI) populations: African-American, economically disadvantage students (low income), and foster youth students. The College's goal is to reduce the equity achievement gap on course success for disproportionately impacted (DI) student populations. Please look at your program data (Tableau) for each of the following DI population. Please pick one or more DI populations that are relevant to your program, set your program goal, indicate the action steps, timeline and responsible parties to achieve program goals.

Course Success by DI Population	Program Set Goals for 2021-2022	Action Steps	Timeline	Responsible Parties	Notes
African American	54.5%	• Continue to support the UMOJA scholars program by providing the program with space and with designated Statistics sections. • Expand UMOJA offerings to include Precalculus course. • Develop professional development activities to help faculty create classroom environments	Fall 2021	Math Faculty, Math Department Chair	

		that foster a sense of belonging. • Communicate through interaction, class policies and materials that the instructor and Math program believes in each students ability to succeed.			
Low Income	62.4%	• Develop professional development activities to help faculty create classroom environments that foster a sense of belonging. • Setting and maintaining high expectations through effective pedagogy. • Increase sections offering Zero Cost Textbooks. • Use of supplemental instruction for students in Math 110, Math 140 and Math 155. • Increase access to graphing calculators and increase use of low/zero cost software to improve content development.	Fall 2021	Math Faculty, Math Department Chair	
Foster Youth	51%	• Develop professional development activities to help faculty create classroom environments that foster a sense of belonging. • Develop professional development to help faculty Set and maintain high expectations through effective pedagogy.	Fall 2021	Math Faculty, Math Department Chair	

3. Assessment Update and Effectiveness (August 26-Sept 30)

a. Please review the data provided on assessment status of courses in your discipline in Cycle 2 (2017/18-2020/21), if there were any courses that were not assessed in Cohorts 1 and 2, please (a) list them, (b) explain why they were not assessed, (b) when are you going to assess them, and (c) who is going to assess them.

Course	Reason course was not assessed	When course will be assessed	Faculty Responsible for Course Assessment

b. Discuss the results of any outcomes assessments (e.g. CSLO) performed this year. What changes, if any, are planned to improve student success?

Math 110: There were five CSLOs which were assessed. CSLO #1: Statistical Literacy Based on statistical reasoning and supported by critical thinking, students should be able to read and critique simple statistics-based studies in order to make an informed judgment on the reliability of the statistical presentation or argument. Showed 81% of students assessed met proficiency.

In CSLO #2: Data Production Students should be able to apply the basic principles of study design to develop and analyze the validity of simple experiments and sampling plans related to a given situation and goal. This CSLO was assessed via a common final exam question and through a class project. From the assessment we learned students are extremely capable of developing survey questions are occasionally able to control and very often able to at least recognize the effects they cannot control because the statistics project is somewhat artificial. Yet, there is a there is a need for students to develop a habit referencing the influence of confounding factors on their conclusions. This can be achieved by faculty modeling this during worked out examples in class and to embed into appropriate lab assignments questions which require students to make this type of analysis. When CSLO was assessed via common final exam question, 96.2% of students assessed met proficiency. CSLO 2 was also assessed by the use of a class project, for this assessment tool 85.5% of students assessed at or above proficient.

CSLO #3: Data Exploration and Representation Students will be able to examine raw data using graphical, tabular, and analytical exploratory tools in order to investigate and describe patterns in data with the goal of describing shape, center, and spread within a quantitative data set, making comparisons among data sets, and looking for relationships between data sets. This CSLO was also assessed using common final exam questions and using the class project. Using the common final exam questions, 93% of students assessed were proficient. This CSLO was also assessed using a class project, in which 74.5% of students assessed were proficient. One plan to improve proficiency rates is to embed into lab assignments questions which prompt students to analyze data and create

graphical representations which students then use to determine if the data supports a given hypothesis.

CSLO #4: Modeling and Inference Students will analyze data to identify an appropriate statistical model, use technology to perform statistical tests or find confidence intervals, explain the concepts underlying inference, and interpret results in a context. Students will also use correlation coefficients and scatterplots to determine if a linear regression model is appropriate, then find, use, and interpret linear regression models when appropriate. This CSLO had the lowest proportion of students who assessed as proficient, 32%. There are plans to make changes to the assessment tool, From the exam there were several suggestions:

1. Put the "P-value explanation problem" connected to the one sample question. Split the P-value question off. Make the 2-sample question come later.

The wording on Problem 1 IV should state the "conclusion to the Hypothesis test" instead of just asking for a conclusion of any sort.

The wording on problem 2 II should ask to "identify the value of the correlation coefficient" and describe the strength of the relationship"
Have students practice more about interpreting the slope, or at least more recently. Work on regression in general. Or decide to cut the regression modeling out of the course all together. Make the regression problem simpler. Don't have the unit on the regression problem be a %. And finally, don't trick the students by having the table variables reversed from their more typical relationship.

Problem 3. To combat P-value confusion, have students practice descriptions like "What does 95% mean in terms of probability or relative frequency?"

CSLO #5: Probability as it Relates to Statistical Inference Students will be able to explain in layman's terms how variability and probability are connected to statistical inference, as well as be able to interpret and apply basic laws and concepts of probability to sampling distributions. This CSLO was assessed using a common final exam and from the class project. 50% of students assessed as proficient via the common final exam questions and 60.5% assessed at or above proficient via the final project. The improvement plan or new strategies to try to improve student learning is to include as part of Math 110 Flex activity methods for how instructors can discuss test statistics, simulations and the roll of z-scores. Further, as part of flex develop course examples which simple, easy to follow and avoid nuance.

Math 155: Course was assessed in Spring 2019. CSLO #1: Pre-calculus literacy, CSLO #2 Functions and Their representations, CSLO #3: Functions and Modeling, CSLO #4: Effective Learning and CSLO #5 Technology.

In this assessment cycle 26% of students met proficiency for CSLO 1: Pre-calculus literacy. In this CSLO students were assessed based on their ability to understand written examples and explanations of pre-calculus concepts, and explain what they have read verbally and in writing using

appropriate mathematical language and concepts. We learned student understanding of units is very low. This was both in the interpretation of units and the use of units in their answers. It was recommended for faculty teaching the course to use materials that emphasize proper use of units as well as the development of course concepts. Further, the assessment instrument needs to have more questions relating to the verbal explanation of a concept. The assessment team determined that the assessment criteria on the COOR should be updated, specifically to add assessment criteria in which students interpret the meaning of function values, y-intercepts, zeros, and average rates of change in context and concavity on given intervals in context.

CSLO 2 assessed Functions and their representations. Students were assessed based on their ability to solve a given problem using different representations of functions. Further, students were expected to construct, analyze, and use linear, exponential, logarithmic, rational, polynomial, and sinusoidal functions, in symbolic, numerical, and graphical form, to investigate concepts and solve problems. 40% of students assessed met proficiency for this CSLO. The assessment team learned that many students had difficulties with basic algebra. It was recommended that the Math department revisit the Math 155 COOR to reassess the amount of content listed to be learned and the number of instructional hours for the course. It is recommended that instructors devote additional instructional time to learning algebra concepts in class.

To assess CSLO 3: Functions and modeling, students had to show an ability to identify an appropriate type of function to model a situation, and to find a specific function to model the situation in order to solve problems; Students should also be able to identify the key aspects of the function (e.g. function values, zeros) that will allow them to solve the problem and to interpret the meaning of these features in context. In CSLO 3, 20% of students assessed met proficiency. Students had difficulty recognizing and working with trigonometric functions. This included when the information included data that was identified and shown to be periodic. Similarly students struggled with finding and using inverse trigonometric functions. In order to improve student success it is recommended for instructors to devote additional instructional time to learning trigonometric concepts in the class. Further, it is recommended that the Math department revisit the Math 40/Math 155 COOR to reassess the amount of content listed to be learned and the number of instructional hours for the course. As a comparison, at Diablo Valley College the same material is taught over two semesters with a total of 9 units of instruction time (Math 134 for 4 units + Math 191 for 5 units). It just may not be possible to teach a majority to students to a level of proficiency (or higher) in just 4 units of student contact.

For CSLO 4: Effective learning, students were assessed based on their ability to effectively work with peers in order to solve problems, revise their work and develop understanding of course concepts. As part of this CSLO students will also take responsibility for learning and self-assessment. This CSLO was assessed using instructor survey and Math Lab participation data. 30% of students assessed showed to be either proficient or high proficient. Only one instructor was able to complete the survey because the Office of Instruction policies did not allow us to have the rosters of students in other sections.

The mean Pre-Calculus student completed about half of their required 36 semester hours of lab assignment time. There were many students who completed fewer than 20% of their required hours. The data from the login computer did not disaggregate the data for the 84 students. There were an additional 39 students' whose data was included. This is most likely from students who attended the lab in the earlier part of the semester but then dropped the course later on. In future assessments faculty should consider Work with the Office of Instruction and/or the Instructional Dean to allow us to use student rosters to perform the instructor surveys as designed by the Pre-Calculus course assessment committee. The assessment committee should also create a second survey that includes the math lab login data so that instructors can correlate success in learning outcomes to math lab participation. This could be done by comparing lab assignment completion and score with the students' logged math lab hours.

CSLO #5: Technology assessed students on their ability to use the computational, tabular, graphical, and regression functions of a graphing calculator, computer algebra system or the equivalent to solve problems and investigate concepts. Further, students were also assessed based on their ability understand the limitations of the use of technology. 32% of students assessed were proficient. Based on the assessment tool we learned that Students had difficulty finding the maximum of a function using technology. One instructor had difficulty giving the students one of the questions that required technology. As a remedy they had students complete the problem on an alternate day using a computer application. This points at the non-uniform interpretation of this CSLO and differences in how the use of technology is incorporated into the course. Students in sections that are not allowed general use of technology on exams are given an unfair disadvantage and will not be able to show they understand appropriate use of technology. Additionally, allowing students to utilize computer technology instead of hand-held calculators opens up questions of whether they are using unapproved aids (such as the internet). The department will investigate possibilities of the use of technology that does not require students to individually own handheld calculators while still being able to ensure the fair use of technology. This includes not allowing students to use outside resources such as the internet or peer-to-peer communication. Further, the department should work on developing Lab assignments and other supplemental curriculum to help students learn, practice and demonstrate the use of technology in solving Pre-calculus problems.

Math 250: There were four CSLOS which were assessed. In CSLO 1 Linear Systems, students had to demonstrate their ability to write and solve linear systems, students will complete lab work, exam problems, and final exam problems that require them to write linear systems to model realistic scenarios; and homework, lab work, unit exams, and final exam problems that require them to solve linear systems using various methods. The results on this CSLO were good, 80% of students met or exceeded the proficiency level for this criterion, a good result. In fact, more than 2/3 of the class demonstrated the highest proficiency level. This is likely because the skills/concepts inherent in CSLO #1 are fundamental to every unit of this class and are continually reinforced throughout the semester. Through this assessment we learned that this is an effective pedagogy for helping students gain proficiency in this outcome.

For CSLO 2 Linear Algebra Reasoning, students were responsible for demonstrating their ability to find and use bases, orthonormal bases, eigenvalues, and eigenvectors, students will solve

problems and analyze scenarios on homework, lab work, exams, and the final exam that require them to find and use bases, orthonormal bases, eigenvalues, and eigenvectors. Students performed the best on this CSLO. In fact 91 % achieved high proficiency. One explanation is that this is the last material in the class and it is fresh in students' minds during the final exam, which was where their skills was measured.

For CSLO 3 students had to demonstrate their ability to find and explain the significance of the dimension of subspaces, students will complete lab work, exam problems, and final exam problems that require them to find dimension; and homework, lab work, unit exams, and final exam problems that require them to explain the significance. As with CSLO #1, we are pleased that 80% of assessed students met or exceeded proficiency on CSLO #3. However, it's noteworthy that fewer demonstrated high proficiency (48% vs. 68%). This is likely because the skills/content inherent in CSLO #3 are more abstract.

For CSLO 4 students were responsible for demonstrating the ability to write proofs, students will write complete lab work, exam problems, and final exam problems that require them to prove basic results in linear algebra using appropriate proof-writing techniques. The results for this CSLO were the worst, more than 1/3 of the class was below the proficiency level. This is not surprising given that the ability to write proofs is both a new skill for most Math 75 students, and one of the most difficult concepts in lower division math classes. Nevertheless, we learned that more emphasis on proof writing would benefit students.

A new strategy to improve student success is to host a Flex activity focused on proof-writing pedagogy for future Linear Algebra (Math 250) and Discrete Mathematics (Math 160) teachers, Ideally this workshop would be held during January 2020 Flex.

4. Course Outline of Record Updates (August 26 – Sept 30)

Please review the data provided on the status of COORs in your discipline. (Note: These data do not reflect courses submitted after May 2019. For each COOR that has *not* been updated since May 2019, please indicate the faculty member responsible for submitting the updated COOR to the Curriculum Committee by **November 1, 2019**.

Course	Faculty Responsible for COOR Update
Math 140 (Previously Math 37)	Maria Magante and Diwa Ramos
Math 120	Mara Landers

Impact of Resource Allocation

If you have received funding via the Resource Allocation Process, you will be asked by the Office of Business Services how the resource helped you in achieving your program goals.

5. Resource Needs (Feb 1 – Feb 28)

Resource needs to meet goals, if any. If there are no requests, this section may be skipped.

Faculty/Staff Resource Request

Department/Unit Goal - Reference #		Strategic Goal and/or Objective - Reference #	

Department/Unit Name		Position Name/Classification	FTE

Position Type	Funding Duration	Funding Source	Est. Salary & Benefits
☐ Faculty R/T ☐ Classified ☐ Manager ☐ Student	☐ On-going/Permanent ☐ One-time	☐ Operations (Fund 11) ☐ Other	

Justification:

Operating Resource Request

Department/Unit Goal - Reference #	Strategic Goal and/or Objective - Reference #

Department/Unit Name	Resource Type
	☐ Equipment ☐ IT Hardware/Software ☐ Supplies ☐ Facility Improvement ☐ Service/Contract ☐ Other

General Description	Est. Expense

Justification:

Professional Development Resource Request

Department/Unit Goal - Reference #	Strategic Goal and/or Objective - Reference #

Department/Unit Name	Resource Type
	☐ Conference/Meeting ☐ Materials/Supplies
	☐ Online Learning ☐ IT Hardware/Software
	☐ Other

General Description	Est. Expense

Justification: