Assessment: Assessment Unit Four Column

Spring/Summer 2017

El Camino: PLOs (MATH) - Math (GE and Non-Science Majors)

PLOs	*Assessment Method Description*	*Results*	*Actions*
PLO #1 Graphical Methods - Students will be able to analyze and solve application problems involving business, the social sciences, and/or biological sciences using graphical methods. **PLO Status:** Active **PLO Assessment Cycle:** 2016-17 (Spring 2017) **Input Date:** 07/01/2013 **Inactive Date:** **Comments:**	**Exam/Test/Quiz -** For our CM2 courses (Mathematics for GE and Non-Science Majors), we utilized a variety of test and quiz problems (given below) to assess student mastery of problem solving skills essential for being successful not only in their current coursework but in their future math and major coursework at their transfer institutions. Our ultimate goal is to prepare our students for their major coursework by teaching them how math applies to their field of study. Math 120 (Nature of Mathematics) - Given a number of data points, construct a Venn diagram to answer questions of the number of data points that have a certain property. Math 130 (College Algebra) - Graph a rational function by clearly stating the intercepts, asymptotes, and using any other necessary points. Math 140 (Finite Mathematics for Business and Social Sciences) - Find the maximum and minimum values	**Semester of Current Assessment:** 2016-17 (Spring 2017) **Standard Met:** Standard Met Across all the CM2 courses administered during Spring 2017, we have the following results for PLO #1 (Graphical Methods): Total Students Assessed: 1371 Scoring a '3' – 36% of students (or 494 students) – Demonstrate complete understanding of the problem being assessed. Scoring a '2' – 36% of students (or 491 students) – Demonstrate most understanding of the problem being assessed. Scoring a '1' – 19% of students (or 263 students) – Demonstrate some understanding of the problem being assessed. Scoring a '0' – 9% of students (or 123 students) – Demonstrate no understanding of the problem being assessed. Overall, we have attained a 72% success rate (that is, scoring a 2 or 3 on the assessment). This meets our target for success of 70% or higher. Analysis:	**Action:** We reached our target success rate overall, but the courses, when looked at individually, did not have consistent success rates. We have set a goal to try new teaching strategies to make the success rates more consistent across all the CM2 courses. This is an important goal to achieve because we want our students to experience similar success in any of the math courses for GE and Non-Science Majors that they take. (09/20/2019) **Action Category:** Teaching Strategies

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	(and the values of x and y at which these occur) of a function involving x and y subject to five constraint inequalities. Math 150 (Elementary Probability and Statistics) - Use a contingency table to answer questions about the probabilities of certain events. Then construct a relative frequency bar graph and use it to interpret the differences between certain relative frequencies. Math 165 (Calculus for the Biological, Management and Social Sciences) - Given an exponential decay function, evaluate an improper integral whose integrand is the given function over a given time period. Then, graph the function and shade the portion of the graph that represents the improper integral. **Standard and Rubric:** Across our CM2 courses, we establish a goal of at least 70% of our students enrolled in the GE and Non-Science Majors mathematics coursework to score a '2' or a '3' on the SLO assessments. This would mean at least 70% of our students will attain most to complete understanding of the problem solving involved. We utilize the following general rubric across the SLO assessments: Score of 3 (Complete Understanding) - Student demonstrates mastery of the problem being presented.	Overall, the CM2 courses mostly reached this target success rate individually, but some courses have higher success rates than others. We can try to make the success rates more even across the courses as well as improve the PLO success rates, To reach these goals, instructors across our CM2 courses have commented on many methods that are helping students learn the concepts quickly as well as methods that they can try to help improve student success. Here are some methods that instructors feel are helping students learn the material better in class. 1. Provide similar problems on study sheets. 2. Go over Powerpoint examples in class and point them online for students to review. 3. Use a combination of going over things by hand and using the graphing calculator to solve problems. 4. Using student instructors (SI coaches) for peer help. 5. Tie the problems into real-world applications in business and biology. Here are some suggestions from instructors on how we can improve student success in CM2 courses. 1. Provide more of a variety of questions from my own sources and not rely solely on the textbook and the associated MyMathLab questions. 2. Give students more time to digest the material before testing them on it. 3. Require stronger prerequisite courses for Math 140. 4. Create activities with similar wordings to train students to pay attention to every word in each question. 5. Bring in charts from real-world materials like journals and ask students to interpret the charts in their own words. 6. Make videos to help teach the material to students so they can watch them when they need review. (09/20/2017) **Faculty Assessment Leader:** Jasmine Ng **Faculty Contributing to Assessment:** Megan Granich, Linda Ho, Jill Evensizer, Benjamin Mitchell, Diaa Eldanaf, Zachary Marks	

PLOs	Assessment Method Description	Results	Actions
	Problem solving techniques and strategies are well thought out and clearly presented. Student can clearly utilize the concepts of the course to solve application problems in a variety of areas. Score of 2 (Most Understanding) - Student demonstrates most understanding of the problem and problem solving techniques involved. With the exception of some computational errors, the student demonstrates strong conceptual understanding and how to apply appropriate problem solving strategy. Score of 1 (Some Understanding) - While some understanding of the concepts and problem solving being assessed is evident, there are significant gaps. Conceptual and procedural errors in problem solving and/or logic are evident. Score of 0 (No understanding) - Student demonstrates very little to no understanding of the problem solving strategies and/or techniques used to solve the assessed problem. **Additional Comments:**	**Courses Associated with PLO Assessment:** Math 120, Math 130, Math 140, Math 150, Math 165	

Assessment: Assessment Unit Four Column

Spring/Summer 2017

El Camino: PLOs (MATH) - Math (Prospective Elementary School Teachers)

PLOs	*Assessment Method Description*	*Results*	*Actions*
PLO #1 Solving Application Problems - Students will be able to determine an appropriate strategy to solve an application problem, complete the solution of the problem, describe the procedures used to solve the problem, and explain the underlying mathematical concepts using written and oral means. **PLO Status:** Active **PLO Assessment Cycle:** 2013-14 (Spring 2014), 2014-15 (Spring 2015), 2015-16 (Spring 2016), 2016-17 (Spring 2017), 2017-18 (Spring 2018) **Input Date:** 07/01/2013 **Inactive Date:** **Comments:**	**Multiple Assessments -** To assess this SLO, faculty teaching Math 110, Math 115, and Math 116 will use tests, quizzes, class activities, projects, homework, and writing assignments to determine the level of success students' have reached regarding this PLO. **Standard and Rubric:** The following rubric will be used to assess this PLO. Score of 4: Students demonstrate a keen understanding of setting up and solving application problems. Students are able to solve the application problems with no errors. Students are able to provide an exemplary explanation of the mathematical concepts for the application problems. Score of 3: Students demonstrate a good understanding of setting up and solving application problems. Students are able to solve the application with minor errors. Students are able to provide a good	**Semester of Current Assessment:** 2016-17 (Spring 2017) **Standard Met:** Standard Met RESULTS Math 110, Math 115, Math 116 Mean = 3.28 Standard Deviation = 0.65 Pearson Correlation Coefficient: -.164 Correlation Conclusion: There is no correlation between number of absences and PLO #1. Average Number of Absences: 1.82 Sample Size: 72 Math 110 Only Mean = 3.36 Standard Deviation = 0.62 Pearson Correlation Coefficient: .04 Correlation Conclusion: There is no correlation between number of absences and PLO #1. Average Number of Absences: 1.80 Sample Size: 52 Math 115 and Math 116 Only Mean = 3.05 Standard Deviation = 0.64 Pearson Correlation Coefficient: -.42 Correlation Conclusion: There is no correlation between number of absences and PLO #1. Average Number of Absences: 1.87 Sample Size: 20	**Action:** We will continue to emphasize the important components of solving application problems, which are carefully selecting an appropriate strategy, predict the potential answer to the problem and check if their answers are reasonable in the context of the problem, and articulate the strategy that was used, the answer to the problem, and why the solution is reasonable and makes sense in the context of the problem. We content that the more practice students have in this endeavor, the stronger their performance will be on this learning outcome. (08/25/2018) **Action Category:** Teaching Strategies **Follow-Up:** Instructors in the Math for Teachers program use activities and group work during class time to allow students the opportunity to explore, practice and discuss different problem solving strategies.

PLOs	Assessment Method Description	Results	Actions
	explanation of the mathematical concepts for the application problems. Score of 2: Students demonstrate a fair understanding of setting up and solving application problems. Students are able to solve the application problems with several errors. Students are able to provide some information about the mathematical concepts for the application problems. Score of 1: Students are unable to demonstrate set up and solve application problems. Students are not able to solve the application problems or they are able to solve the application problems with significant errors. Students are not able to provide an explanation of the mathematical concepts for the application problems. CORRELATION BETWEEN THE NUMBER OF ABSENCES AND THE SUM OF THE SCORES FOR THE 3 PLOS To determine if there is a positive correlation, negative correlation, or no correlation, the Pearson Correlation Coefficient was used. The Pearson Correlation Coefficient represents the slope of the Best Fit	At least 70% of the students in Math 110, 115, and 116 have reached the benchmark of a score of 3 or higher. The mean and standard deviation for PLO #1 have remained consistent over time. Students are able to successfully select an appropriate strategy to solve application problems, determine the reasonableness of their answers, and communication their strategies and solutions in written and oral means. In addition, the average number of absences for students enrolled in Math 110, Math 115, and Math 116 has decreased as compared to the students in these courses during the Spring 2016 semester. We acknowledge that even though the data is limited, we continue to be encouraged with this trend and will examine this trend over time. (08/25/2017) **Faculty Assessment Leader:** Judy Kasabian **Faculty Contributing to Assessment:** Susie Tummers, Judy Kasabian, Susanne Bucher **Courses Associated with PLO Assessment:** Math 110, Math 115, Math 116	(09/05/2018)

PLOs	Assessment Method Description	Results	Actions
	Line representing the data. The following scale is used to determine correlation. Pearson Correlation Coefficient = 1.0 [Perfect Positive Correlation] Pearson Correlation Coefficient between 0.7 and 1.0 [Acceptable Positive Correlation] Pearson Correlation Coefficient between 0.7 and -0.7 [No Correlation] Pearson Correlation Coefficient between -0.7 and -1.0 [Acceptable Negative Correlation] Pearson Correlation Coefficient = -1.0 [Perfect Negative Correlation] TARGET FOR SUCCESS The Math for Teachers Committee has determined that 70% of students attaining a rubric score of 3 as the target of success. **Additional Comments:**		
PLO #2 Explaining Mathematical Concepts - Students will be able to demonstrate and explain mathematical concepts using a variety of methods. **PLO Status:** Active **PLO Assessment Cycle:** 2013-14 (Spring 2014), 2014-15 (Spring 2015), 2015-16 (Spring 2016), 2016-17 (Spring 2017), 2018-19 (Spring 2019) **Input Date:** 07/01/2013 **Inactive Date:** **Comments:**	**Multiple Assessments -** To determine the score (using the scoring rubric) for each student in Math 110, Math 115, and Math116, instructors use tests, quizzes, projects, group work, group discussions, and activities. **Standard and Rubric:** RUBRIC FOR ASSESSMENT Score of 4: • Students demonstrate a keen understanding of a variety of mathematical concepts. • Students are able to	**Semester of Current Assessment:** 2016-17 (Spring 2017) **Standard Met:** Standard Met Math 110, Math 115, Math 116 Mean = 2.94 Standard Deviation = .51 Pearson Correlation Coefficient: -.19 Correlation Conclusion: There is no correlation between number of absences and PLO #2. Average Number of Absences: 1.82 Sample Size: 72 Math 110 Only Mean = 2.94 Standard Deviation = .75	**Action:** We continue to contend that explaining mathematical procedures is significantly less difficult than explaining mathematical concepts. When a student can explain a mathematical concept, they show a deeper and more comprehensive understanding of the mathematics and are able to connect mathematical ideas in a logical way. We also contend that for future teachers, it is extremely important that they are

PLOs	Assessment Method Description	Results	Actions
	provide an exemplary explanation of a variety of mathematical concepts in written and oral means. Score of 3: • Students demonstrate a good understanding of a variety of mathematical concepts. • Students are able to provide a good explanation of a variety of mathematical concepts in written and oral means. Score of 2: • Students demonstrate a fair understanding of a variety of mathematical concepts. • Students are able to provide fair explanation about a variety of mathematical concepts in written and oral means. Score of 1: • Students are unable to demonstrate any understanding of a variety of mathematical concepts. • Students are not able to provide an explanation of a variety of mathematical concepts in written and oral means. CORRELATION BETWEEN THE NUMBER OF ABSENCES AND THE SUM OF THE SCORES FOR THE 3 PLOS To determine if there is a positive correlation, negative correlation, or no correlation, the Pearson Correlation Coefficient was used. The Pearson Correlation Coefficient represents the slope of the Best Fit Line representing the data. The	Pearson Correlation Coefficient: -.51 Correlation Conclusion: There is no correlation between number of absences and PLO #2. Average Number of Absences: 1.80 Sample Size: 52 Math 115 and Math 116 Only Mean = 2.99 Standard Deviation = 0..66 Pearson Correlation Coefficient: -.51 Correlation Conclusion: There is no correlation between number of absences and PLO #2. Average Number of Absences: 1.87 Sample Size: 20 At least 70% of the students in Math 110, 115, and 116 have reached the benchmark of a score of 3 or higher. The mean and standard deviation for PLO #2 has returned to the typical performances of Math 115 and Math 116 students which is in contrast with the findings from Spring 2016. The mean and standard deviation results continue to exhibit that asking students to explain concepts in an articulate and complete fashion is still a difficult task for some students. We continue to contend that for future teachers, being able to explain concepts and procedures in a clear fashion is imperative for anyone who plans to become a classroom teacher. (08/25/2017) **Faculty Assessment Leader:** Judy Kasabian **Faculty Contributing to Assessment:** Judy Kasabian, Susie Tummers, Susanne Bucher **Courses Associated with PLO Assessment:** Math 110, Math 115, Math 116	competent in explanations of procedures and concepts since this is what will be required of them when they become classroom teachers. We will continue to emphasize the importance of explanations in class discussions, projects and assignments, and on a variety of assessments. In addition, the average number of absences for students enrolled in Math 110, Math 115, and Math 116 has decreased as compared to the students in these courses during the Spring 2016 semester. We acknowledge that even though the data is limited, we continue to be encouraged with this trend and will examine this trend over time. (08/25/2018) **Action Category:** Teaching Strategies **Follow-Up:** Instructors in the Math for Teachers program continue to emphasize the importance of explanations in class discussions, projects, assignments and assessment. (09/05/2018)

PLOs	Assessment Method Description	Results	Actions
	following scale is used to determine correlation. Pearson Correlation Coefficient = 1.0 [Perfect Positive Correlation] Pearson Correlation Coefficient between 0.7 and 1.0 [Acceptable Positive Correlation] Pearson Correlation Coefficient between 0.7 and -0.7 [No Correlation] Pearson Correlation Coefficient between -0.7 and -1.0 [Acceptable Negative Correlation] Pearson Correlation Coefficient = -1.0 [Perfect Negative Correlation] TARGET FOR SUCCESS The Math for Teachers Committee has determined that 70% of students attaining a rubric score of 3 as the target of success. **Additional Comments:**		
PLO #3 Analyzing Mathematical Problems and their Solutions - Students will be able to analyze a solution to a mathematics problem, determine the appropriateness of the solution, and if errors are made, explain the misconceptions or errors made and how to solve the problem correctly using written and oral means. **PLO Status:** Active **PLO Assessment Cycle:** 2013-14 (Spring 2014), 2014-15 (Spring 2015), 2015-16 (Spring 2016), 2016-17	**Multiple Assessments -** To determine the score (using the scoring rubric) for each student in Math 110, Math 115, and Math 115, instructors use tests, quizzes, projects, group work, group discussions, and activities. **Standard and Rubric:** Score of 4: • Students demonstrate a keen understanding of the representation of the answers to a variety of problems in written and oral means. • Students are able to	**Semester of Current Assessment:** 2016-17 (Spring 2017) **Standard Met:** Standard Met Math 110, Math 115, Math 116 Mean = 2.94 Standard Deviation = 0.51 Pearson Correlation Coefficient: -.05 Correlation Conclusion: There is no correlation between number of absences and PLO #3. Average Number of Absences: 1.82 Sample Size: 72 Math 110 Only Mean = 2.94 Standard Deviation = 0.75	**Action:** We strongly believe that this learning outcome is challenging for all mathematics students and also a necessary skill for those who plan to be classroom teachers. We will continue to diligently offer students many opportunities, through classroom discussions, projects and activities, and on assessments, to strengthen their skills and knowledge of this learning outcome. We will continue to offer our students

PLOs	Assessment Method Description	Results	Actions
(Spring 2017), 2019-20 (Spring 2020) **Input Date:** 07/01/2013 **Inactive Date:** **Comments:**	provide a clear and complete explanation of the appropriateness of answers to problems in written and oral means. • Students are able to provide a clear and complete explanation of the misconceptions or errors made in problems using written and oral means. Score of 3: • Students demonstrate a good understanding of the representation of the answers to a variety of problems in written and oral means. • Students are able to provide a good explanation of the appropriateness of answers to problems in written and oral means. • Students are able to provide a good explanation of the misconceptions or errors made in problems using written and oral means. Score of 2: • Students demonstrate a limited understanding of the representation of the answers to a variety of problems in written and oral means. • Students are able to provide a limited explanation of the appropriateness of answers to problems in written and oral means. • Students are able to provide a limited explanation of the misconceptions or errors made in problems using written and oral means. Score of 1:	Pearson Correlation Coefficient: -.042 Correlation Conclusion: There is no correlation between number of absences and PLO #3. Average Number of Absences: 1.80 Sample Size: 52 Math 115 and Math 116 Only Mean = 2.90 Standard Deviation = 0.63 Pearson Correlation Coefficient: .10 Correlation Conclusion: There is no correlation between number of absences and PLO #3. Average Number of Absences: 1.87 Sample Size: 20 At least 70% of the students in Math 110, 115, and 116 have reached the benchmark of a score of 3 or higher. Unlike Spring 2016, the mean for Math 115 and Math 116 students is lower than what is typically exhibited. This may be a function of these students or a trend to watch for. Regardless, we will continue to keep a close eye on this data or any trends and examine how we can assist students improve on this PLO. We contend that this important skill for all classroom teachers develops over time and we are pleased to see that students in Math 115 and 116 show stronger performance on this learning outcome. (08/25/2017) **Faculty Assessment Leader:** Judy Kasabian **Faculty Contributing to Assessment:** Judy Kasabian, Susie Tummers, Susanne Bucher **Courses Associated with PLO Assessment:** Math 110, Math 115, Math 116	challenging problems and sufficient time to practice these skills so that they will be able to utilize these skills in their own classrooms once they become teachers. In addition, the average number of absences for students enrolled in Math 110, Math 115, and Math 116 has decreased as compared to the students in these courses during the Spring 2016 semester. We acknowledge that even though the data is limited, we continue to be encouraged with this trend and will examine this trend over time. (08/25/2018) **Action Category:** Teaching Strategies **Follow-Up:** Instructors in the Math for Teachers program continue to offer students many opportunities, through classroom discussion, projects, activities and assessments to strengthen their ability to analyze a solution and determine the misconception a student may have. (09/05/2018)

PLOs	Assessment Method Description	Results	Actions
	• Students are unable to demonstrate the representation of the answers to a variety of problems in written and oral means. • Students are not able to provide an explanation of the appropriateness of answers to problems in written and oral means. **Additional Comments:** No room in the Standard and Rubric to present the Standard for Success. The Standard for Success is 70% attainment.		

Assessment: Assessment Unit Four Column

Spring/Summer 2017

El Camino: PLOs (MATH) - Pre-Engineering

PLOs	*Assessment Method Description*	*Results*	*Actions*
PLO #2 Solving Applied Problems in Engineering - Students will apply principles from mathematics, physics, and chemistry to solve applied problems in engineering. **PLO Status:** Active **PLO Assessment Cycle:** 2014-15 (Spring 2015), 2016-17 (Spring 2017) **Input Date:** 07/01/2013 **Inactive Date:** **Comments:**	**Exam/Test/Quiz -** On a take home exam, students were directed to draw the shear and bending moment diagrams for a beam shown in a figure provided. Then they are to determine the shear and moment at the middle of the beam. Students who drew incorrect shear and moment diagrams, or wrote nothing, earned a score of 0, corresponding to "no understanding", while students who drew the shear diagram correctly, but not the moment diagram, earned a score of 1, which corresponded to "some understanding". Scores of 0 or 1 corresponded to students being unsuccessful at this SLO. Students in the "most understanding" category completed the problem correctly, but did not label axes and constructed incorrect scales, earned a score of 2. Those students in the "complete understanding" category completed the problem with no errors and earned the maximum score of 3. Scores of 2 and 3 corresponded to students being successful at this SLO.	**Semester of Current Assessment:** 2016-17 (Spring 2017) **Standard Met:** Standard Not Met There were 28 students who were assessed for this SLO. Fifteen of them (53%) scored 3 and 5 (18%) scored 2. Thus, 71% of the students were successful at this SLO. Five (18%) scored 1 and 3 (11%) scored 0. Thus, 29% of the students were unsuccessful at this SLO. This falls below the 90% target success rate. Next time that the course is taught, the instructor will assign, collect, and grade homework related to drawing diagrams and determining distributed forces, shear forces, and moments in beams. ANALYSIS: Most students did well. The students in the “Most understanding” category did the problem correctly, but made easily correctable errors such as not labeling axes sufficiently or drawing the diagrams sloppily (not using a straight-edge when appropriate, not using a linear scale on the axes). In several cases they simply did not answer part of the question, even though the information necessary for the answer was evident in their work. (They don’t get credit if I have to search for the answer.) The students in the “Some understanding” category drew the shear diagram correctly, but messed up on the bending moment diagram. The 3 students in the lowest category did not even draw the	**Action:** Next time that the course is taught, the instructor will assign, collect, and grade homework related to drawing diagrams and determining distributed forces, shear forces, and moments in beams. (09/18/2018) **Action Category:** Teaching Strategies

PLOs	Assessment Method Description	Results	Actions
	Standard and Rubric: The target for success was 90%, since Engineering 9 is an advanced course for a Community College, requiring both a Physics and Calculus II prerequisite. **Additional Comments:**	shear diagram correctly. Even though most students did well on the exam, getting the correct answer, some of them did FAR more work than was necessary. I don't know if that was because they didn't understand the shortcuts or didn't think that I wanted them to use them. It was a take home exam, so they had plenty of time to do the problems the long way. I went out of my way to emphasize and explain the shortcuts and fewer students failed to use them than in previous semesters. The diagrams were sized better than in the past and drawn more neatly. Next semester I will try to collect and grade some homework problems similar to this problem, prior to the exam. There is often a crush near the end of the semester, so even when I collect problems, I am not always able to get them graded before the exam. Also there is not enough time in class for the students to practice working the (long) problems. I plan to try to get this course changed to a 3-unit, 4-hour class to allow an hour of in class problem solving each week. That would help a great deal. [more] (09/18/2017) **Faculty Assessment Leader:** Jill Evensizer **Faculty Contributing to Assessment:** Milan Georgevich **Courses Associated with PLO Assessment:** Engineering 9	