Assessment: Course/Service Four Column

Dept - (PSME) Mathematics

MATH 10:Elementary Statistics and Probability

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MATH10_SLO_1 - Organize, analyze, and utilize appropriate methods to draw conclusions based on sample data by constructing and/or evaluating tables, graphs, and numerical measures of characteristics of data. **SLO Status:** Active **Planned Assessment Quarters:** 2012-13 2-Fall	**Exam - Course Test/Quiz -** Quiz question on best point estimates, both symbols and values for a population parameter **Target for Success:** At least 75% of students in 5 Math 10 sections correctly identifying the best estimate for the population proportion as the sample proportion and giving the appropriate symbol and calculating its correct value.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met 89% of students provided the correct symbol for the sample proportion and 91% found its correct value. (11/16/2012) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** With an average of 9 correct responses of 10, students were extremely competent with recognizing proper symbols and performing correct calculations for sample statistics.	**Enhancement:** Continue stressing the numerical relationship between parameters and statistics. (04/20/2013)
	Laboratory Project - Students create descriptive statistics, charts and graphs from several real world data sets. They must draw valid conclusions by interpreting the graphs and make "common sense" inferences that will be compared later to actual hypothesis test results. **Target for Success:** 80% of students successfully complete lab.	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met 20 out of 24 students received passing grade. (03/13/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Pleased with results, but 3 students failed to turn in the project. For future, I will send out more reminders.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Met Out of 57 students 46 successfully completed the lab showing competence in descriptive statistics (04/11/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Overall students still struggle with proper notation and identifying the difference between parameters and statistics.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Met	**Enhancement:** Continue to keep the data fresh and monitor the

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		95% of students successfully completed the lab. (12/12/2012) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** This result far exceeded the benchmark established for the lab. Students worked well in groups which helped the success of the lab.	results of this successful lab. (12/12/2012)
	Exam - Course Test/Quiz - A final exam question including creating a relative frequency table and calculating sample statistics using appropriate notation **Target for Success:** At least 75% of students will achieve a score of 75% or better on the assessment question	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Final exam questions The table below shows the number of times a week students play video games, on average, during the course of a week. What proportion of students play video games at most 3 times a week: What is the cumulative relative frequency for students who play video games 5 times a week? Out of 76 questions, there were 67 correct answers or 88% correct. (03/26/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Based on above data, students successfully understood the SLO.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Met out of 30 students tested, 24 achieved a 75% or better on the assessment question (01/15/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Overall students struggle the most with correct notation but have the general concepts.	**Enhancement:** A greater focus on appropriate notation in lecture and homework will be implemented. (01/15/2013)
	Project - Students create graphs from survey data and made intuitive inferences **Target for Success:** 80% completion rate	**Program Review Reporting Year:** 2013-2014 **Target :** Target Not Met 18 out of 23 (78.2%) of the projects created the correct graph. 14 out of 23 (60.9%) of the projects had the correct inferences drawn from the graph. (01/28/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Will rewrite the "inference" question to more clearly emphasize what is being asked. Will discuss inferences from graphs more in future classes.	

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		Program Review Reporting Year: 2012-2013 **Target :** Target Met 100% of students successfully completed this part of the project. (03/23/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Discussed project with colleague and shared assessment	**Enhancement:** Increase the challenge of this part of the project. (03/23/2013)
	Exam - Course Test/Quiz - Successful passing of first exam. **Target for Success:** 70% of students achieving a passing score. **Comments/Notes:** 74% of student obtained a passing score, including 41% of students who received A's.		
	Exam - Course Test/Quiz - answer a variety of questions requiring proper identification of variables, analysis of numerical statistics, and interpretation of graphical results **Target for Success:** 65% of students with a passing exam score	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met 68% of students successfully passed exam. (06/21/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students who did not pass, by and large, were not putting in the time and effort to understand the concepts.	
	Laboratory Project - Minitab lab - Students will successfully organize raw data into descriptive statistics and graphs. The students will then explain and interpret their statistics and graphs. **Target for Success:** 90% completion rate.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met 95% of students successfully completed this lab. Explanations ranged from acceptable to outstanding. (06/24/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Lab was considered successful, no major changes needed	
	Project - Students complete a group project to collect and analyze data using statistical methods, graphs and measures studied in class. They were given instructions for completion of the project and a rubric for how they would be graded. Students were awarded points based on successful completion of each criterion in the rubric. The points were then totaled	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met 29 students (94% of the class) scored 39 or higher on the project. All 29 students scored between 45 and 50 points on the project (the equivalent of an A), with 4 students received 50 out of 50 on this group project (03/24/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I was very pleased by the performance of the class on this project. At the time the project was assigned, students were given the rubric for how the project would be graded. I think that this helped the students to include the required	**Enhancement:** In the future, I will continue to give students the grading rubric for the project ahead of time, and I will also continue to post a past example of an A project. Both of these seemed to really help students. I am also pleased that the enhancement regarding outlier calculations was effective. To help students with going over

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	and a grade given for the project. **Target for Success:** Success was defined as at least 70% of students scoring at least 39 out of 50 points on the project.	components of the project. In addition, the week before the project was due, I posted copies of 2 past projects so students could see what an A project looked like. In particular, the section on finding outliers was very well done. This had been a problem in the past and so I emphasized the procedure for finding outliers this quarter. This seems to have helped. There were a few groups who lost points for one reason or another. The groups that did not score at the targeted level did not use the rubric and were missing some required elements. Groups also lost points because their calculations were not correct. I had invited students to have me check over their projects during my office hours in order to catch any errors, but only two groups took advantage of this.	their work, next time I will be more careful to go from group to group and see if they would like me to check over the work they had done. (03/24/2017)
		Program Review Reporting Year: 2015-2016 **Target :** Target Met 30 students (91% of the class) scored 39 or higher on the project. 20 of the students scored between 45 and 50 points on the project (the equivalent of an A), with the remaining 10 students scoring 39 – 44 points (a B). 6 students received 50 out of 50 on this group project (06/13/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I was very pleased by the performance of the class on this project. At the time the project was assigned, students were given the rubric for how the project would be graded. I think that this helped the students to include the required components of the project. In addition, the week before the project was due, I posted copies of 2 past projects so students could see what an A project looked like. In particular, the section on finding outliers was very well done. This had been a problem in the past and so I emphasized the procedure for finding outliers this quarter. This seems to have helped. There were a few groups who lost points for one reason or another. The groups that did not score at the targeted level did not use the rubric and were missing some required	**Enhancement:** In the future, I will continue to give students the grading rubric for the project ahead of time, and I will also continue to post a past example of an A project. Both of these seemed to really help students. I am also pleased that the enhancement regarding outlier calculations was effective. To help students with going over their work, next time I will be more careful to go from group to group and see if they would like me to check over the work they had done. (06/13/2016)

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		elements. Groups also lost points because their calculations were not correct. I had invited students to have me check over their projects during my office hours in order to catch any errors, but only two groups took advantage of this.	
		Program Review Reporting Year: 2013-2014 **Target :** Target Met All students in the class scored at least 39 out of 50 points on the project. 21 students (62%) of the students scored 45 – 50 points (the equivalent of an A) including 10 students (29%) who scored 50 out of 50. The remaining 38% of the students received scores of 41 to 44 points (the equivalent of a B) on the project. (06/24/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I was very pleased by the performance of the class on this project. At the time the project was assigned, students were given the rubric for how the project would be graded. I think that this helped the students to include all of the required components of the project. In addition, the week before the project was due, I posted a copy of a past project so students could see what an A project looked like. There were a few groups who lost points for one reason or another. Two groups failed to write the population, sample, parameter and statistic for their project. In addition, there were a few groups that made errors in identifying outliers. There seemed, in those groups, to be some confusion between the calculation of the limits for an outlier, and the identification of the outlier itself.	**Enhancement:** In the future, I will continue to give students the grading rubric for the project ahead of time, and I will also continue to post a past example of an A project. Both of these seemed to really help students – the projects for this class were probably the best I have ever gotten for consistency of quality. To help students with the outlier portion of the project, I will make sure that I do additional examples of calculating outliers using the two methods we discussed prior to assigning the project. (06/24/2015)
		Program Review Reporting Year: 2012-2013 **Target :** Target Met All students in the class scored at least 39 out of 50 points on the project. 21 students (62%) of the students scored 45 – 50 points (the equivalent of an A) including 10 students (29%) who scored 50 out of 50. The remaining 38% of the students received scores of 41 to 44 points (the equivalent of a B) on the project. (07/01/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** : I was very pleased by the performance of the class on this project. At	

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		the time the project was assigned, students were given the rubric for how the project would be graded. I think that this helped the students to include all of the required components of the project. In addition, the week before the project was due, I posted a copy of a past project so students could see what an A project looked like. There were a few groups who lost points for one reason or another. Two groups failed to write the population, sample, parameter and statistic for their project. In addition, there were a few groups that made errors in identifying outliers. There seemed, in those groups, to be some confusion between the calculation of the limits for an outlier, and the identification of the outlier itself.	
	Exam - Course Test/Quiz - Quizzed students on ability to use z-scores to compare three animal weights relative to species based on a chart of statistics. **Target for Success:** Target for Success: 70% students understanding the numerical results and communication the practical results with a sentence.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met 74% of students responded with correct numerical calculations and clear explanations of the result. (10/15/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** More writing requirements in class will help raise students' ability to explain numerical results.	
	Exam - Course Test/Quiz - evaluating student ability to find probabilities using two-way contingency tables and selected probability statements, and finding relative measures and explaining how to use those measures to reach results. **Target for Success:** Average class score of 65%.	**Program Review Reporting Year:** 2014-2015 **Target :** Target Met Class average for quiz was 75%. (10/09/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** This was one of the first quizzes given to students. As such, they performed well.	
	Project - Students will gather sample data and a create relative frequency table, boxplot and histogram of the data, properly interpreting the data.	**Program Review Reporting Year:** 2014-2015 **Target :** Target Met All students were successful! (01/20/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** All students were successful, which is a great start to the quarter!	

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	Target for Success: 90% of groups will be 90% or better on the project.	Having time in class to work on this project was helpful for student success.	
		Program Review Reporting Year: 2014-2015 **Target :** Target Not Met 89% average score, 57% scored 90% or above. (10/07/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** In future classes, I need to emphasize scaling and labelling graphs.	
		Program Review Reporting Year: 2013-2014 **Target :** Target Met Students did an excellent job on this project. I was quite pleased. (05/05/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Some still need to work on the organizational skills when presenting a paper. Having more examples for them to look at on my website should help in the future.	
	Exam - Course Test/Quiz - Successful passing of first exam. **Target for Success:** 70% of students achieving a passing score. **Comments/Notes:** 74% of student obtained a passing score, including 41% of students who received A's.	**Program Review Reporting Year:** 2014-2015 **Target :** Target Not Met Only 23% of students passed. This was very disappointing. (05/05/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I will survey students to see what I can do to better help them and what they can do to help learn the material.	
		Program Review Reporting Year: 2014-2015 **Target :** Target Met 74% of students achieved a passing score. (01/29/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** compared results with other instructors	**Enhancement:** I will be reviewing additional examples using two-way contingency tables (02/05/2015)
	Laboratory Project - Students collected data in class and were asked to analyze it then draw appropriate conclusions. Students were given a complete grading rubric and assigned group grades upon completion. **Target for Success:** At least 70% of students get 70% or better	**Program Review Reporting Year:** 2014-2015 **Target :** Target Met 14/19 students successfully completed this lab. (03/27/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students have trouble differentiating between the value of a percentile and the location of the percentile. More work can be done on graphical representations of data.	
	Laboratory Project - Students choose the appropriate graphs	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met	**Enhancement:** none (12/12/2019)

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	based on whether data is categorical, numerical or both. Students then create the appropriate graph and then describe center, shape and spread and make comparisons **Target for Success:** 85% successfully complete lab	100% successfully completed lab (Fall 2019) (12/12/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students were very enthusiastic and engaged	
		Program Review Reporting Year: 2015-2016 **Target :** Target Met Students were given data from the website rate my professor and created dot plots of rating, cross-tabulated by various categorical variables. They then described visually the center, shpae and spread of the data. (04/24/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 100% of students completed project successfully. A possible enhancement would be to look at other data sets.	**Enhancement:** Add additional data sets to the lab. (04/24/2016)
		Program Review Reporting Year: 2014-2015 **Target :** Target Met 95% of students successfully completed Minitab lab project demonstrating an understanding of graphs. (06/12/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Discussed lab project with two other stat instructors who may incorporate a similar project in their courses.	
	Exam - Course Test/Quiz - Quiz covering organizing, displaying and analyzing data. **Target for Success:** Class average quiz score of 70%.	**Program Review Reporting Year:** 2015-2016 **Target :** Target Met Class average quiz score of 80% (11/10/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students were competent overall with data organization. Additional emphasis on variable definitions would be helpful.	
	Laboratory Project - Minitab lab where students construct dotplots from a data set and interpret center, shape and spread of data. **Target for Success:** mean score of 80%		
	Laboratory Project - Student will create descriptive statistics and graphs from a large data set and then successfully describe the center, shape, spread and unusual observations **Target for Success:** mean score of 90%	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met 34 students worked in groups to complete the lab where data was taken from a study about discrimination for people using the AirBnB platform. All students successfully completed the lab. (03/18/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Everyone thought this was an effective lab since the data came from	

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		an actual Harvard study which showed that AirBnb hosts were discriminating against people whose names didn't sound "white". Airbnb has since changed their platform.	
		Program Review Reporting Year: 2015-2016 **Target :** Target Met Mean score on lab was 95% - Students were successfully able to grasp th concepts (06/22/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students created different graphs and were successfully able to contrast and compare to the descriptive stats.	**Enhancement:** change data for next quarter (06/22/2016)
	Exam - Course Test/Quiz - Exam 3 deals with confidence intervals and hypothesis testing requires students use SLO 1 **Target for Success:** 70% pass rate	**Program Review Reporting Year:** 2015-2016 **Target :** Target Not Met 17 out of 30 students taking the exam passed (06/22/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Most of questions students got wrong dealt with choosing incorrect distribution to carry out hypothesis test, need to spend more time emphasizing how to choose the correct distribution for hypothesis test.	
	Laboratory Project - Students collect sample data on campus using randomized methods then summarize and interpret results using histograms, frequency tables, box plots and measures of center and dispersion. **Target for Success:** At least 80% of students correctly portraying sample data using histograms.	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met The students collected data on units taken by students. Working in groups, they created and interpreted the graphs. (12/19/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students enjoyed this exercise and were able to accurately interpret the center, shape spread and outliers.	
	Laboratory Project - Students will complete Lab 1 in R where they are required to create and interpret boxplots and histograms and use numerical measures of center and spread to describe data sets. **Target for Success:** 75% of students will earn an 80% or higher on the lab.	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met 90% of students were able to earn an 80% or higher on their Lab 1 grade. (06/28/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** This was an MPS class so the high success rate was due also in part to having extra supports in class.	
		Program Review Reporting Year: 2018-2019 **Target :** Target Met 38/38 students scored an 80% or higher on this lab.	

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		(03/29/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** This class was a standout class. They really took to the challenge of learning R and got excited about the new software. (A non-MPS class).	
MATH10_SLO_2 - Identify, evaluate, interpret and describe data distributions through the study of sampling distributions and probability theory. **SLO Status:** Active	**Exam - Course Test/Quiz -** Make a visual connection between the probability distribution of a random variable, the proportion of one sample, and the population proportion, a parameter. Sketch the shape of the distribution and designate the resulting confidence level corresponding to an area of probability under the distribution curve of the random variable. Include a second axis for standardized scores. **Target for Success:** The combined student scores in 5 Math 10 sections should total at least 70% of all possible points assigned for the problem.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met 73% of total points were awarded for student answers. (11/16/2012) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** About 3 out of every 4 students, on average, were able to take the numerical results and present a properly labeled and scaled graph to represent the results.	**Enhancement:** Continue to stress graphical interpretations of confidence intervals. (04/20/2013)
	Laboratory Project - Students are required to identify and simulate several random variables by analyzing the real life word problem and using an inverse pdf and a random number generator to create random samples. The students then verify the model by calculating the sample mean, median and standard deviation to compare to the population values, and then make histograms and box plots of the data an compare to the expected result. **Target for Success:** 80% of students successfully complete lab.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met 90% of students successfully completed lab. (12/12/2012) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students initially struggled on the lab, but after some help 90% were able to successfully complete the lab.	**Enhancement:** Improve instructions for lab and give a clearer example of the process. (04/15/2013)

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	Exam - Course Test/Quiz - A final exam question where student are asked to calculate probabilities using correct notation for different distributions. **Target for Success:** At least 75% of students will achieve a score of 75% or better on the assessment question	**Program Review Reporting Year:** 2012-2013 **Target :** Target Not Met Out of 50 students 26 correctly completed a question on probability distributions on the final exam. (04/11/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The students are unsure of which probability rules to use in different situation and continue to be uncomfortable with the uniform distribution. More work with the interaction of these two topics is needed.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Not Met Out of 30 students tested, 17 students achieved a score of 75% or better. (01/15/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students struggle with interpreting the correct inequalities for a given situation. Without this starting point, students have a hard time completing the problem. Students also struggle to identify the correct distribution to use in a given situation.	**Enhancement:** For Winter 2013, more practice on interpreting probability notation will be included (01/15/2013)
	Exam - Course Test/Quiz - Exam question on choosing correct sampling distribution. **Target for Success:** 70% get answer correct	**Program Review Reporting Year:** 2011-2012 **Target :** Target Met final exam question: The weight of Snickers candy bars are uniformly distributed between 1.8 and 2.2 ounces. We sample a box of snicker bars containing 48 snicker bars. The distributed for the average weight of 48 snicker bars is. One the final, 30/34 students got the correct answer or 88% (04/25/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Based on data collected, it looks like the students successfully understood this SLO.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Met 76% of students correctly answered this question. (03/23/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Discussed using questions as assessments with colleague	**Enhancement:** Future evaluation of a different area of this SLO (03/23/2013)
	Exam - Course Test/Quiz - Students		

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	required to construct the probability distribution function for the winnings resulting from a "carnival game." In addition, they needed to write a sentence interpreting the expected average winnings from the game. **Target for Success:** 75% of students successfully responding	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met 80.1% of students correctly setting up and interpreting the expected winnings (05/13/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students were generally comfortable with the concept. Some had difficulty with understanding the definition of the variable when constructing the probability distribution function	
	Laboratory Project - Minitab project simulating continuous random variables. Students will compare simulated data sample statistics with expected population parameters. **Target for Success:** 90% completion rate.	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met All students completed project. (Fall 2019) (12/12/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I introduced new data - students didn't miss a beat - great job	
		Program Review Reporting Year: 2015-2016 **Target :** Target Met Students were asked to simulate the Normal and Exponential distributions and then compare the sample statistics with the population parameters. 100% of students successfully completed the lab. (04/24/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** A difficult lab for students, but analysis was accurate and complete in most cases.	**Enhancement:** Add additional random variables to simulate, including empirical data derived pdfs (04/24/2016)
		Program Review Reporting Year: 2012-2013 **Target :** Target Met 100% completion (06/24/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Although the target was met, I felt that 30% of the students did not adequately compare the descriptive statistics to the population parameters.	
	Laboratory Project - For the probability theory part of this SLO, students completed a sampling lab that involved various probability laws. Students completed the lab in groups of 4. Each group generated their own data, based on a sample of M&M candies, constructed two tree diagrams illustrating the theoretical	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met On the Probability Lab, all except 3 students (90.9%) scored at least 20 out of 25 on the lab. The student who scored lower than 70% had not done several parts of the lab, and were not accurate in the counting parts of the lab. In addition, 60.6% (20 students) of the class received 22.5 points or better – the equivalent of an A. On the Central Limit Theorem Lab, 29 students (87.8%)	**Enhancement:** I was very happy with the results of both Labs. In the future, I will make sure that I am more attentive to all of the groups and check that they actively working on the lab and on track to complete it in the time allotted. (06/22/2018)

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	probabilities, and then did the experiment. The lab was graded for correctness of the calculated probabilities and answers to summative questions For the sampling distributions part of the SLO, students completed a lab that examined the Central Limit Theorem. Students completed the lab in groups of 4. The groups completed the lab based on sample data collected by the class. The lab was graded for correctness of the calculated probabilities and answers to summative questions. **Target for Success:** On the Probability Lab, success was at least 70% of students scoring at least 20 out of 25 (a B or better on the lab). On the Central Limit Lab, success was at least 70% of students scoring at least 20 out of 25 (a B or better on the lab).	scored at least 20 out of 25 on the lab. In fact, 54.5% of the students scored 22.5 points out of 25 or better – the equivalent of an A. Three of the students who did not meet the objective on the lab scored 19 out of 25, the result of not answering the summary questions correctly and completely. One student did not turn in the lab, and so received a 0 on the assignment. (06/22/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** On the probability lab, the most common mistakes made were mostly careless errors in writing the theoretical probabilities, or errors in the counting the outcomes needed to compute the empirical probabilities. On the questions, all groups were able to identify that increasing the number of times the experiment was done would result in the empirical probabilities getting closer to the theoretical, but failed to mention that that was a consequence of the law of large numbers. The student who did not achieve a score of 80% or higher had not completed the lab. They had left large sections of the lab undone. I had given time in class over a full week to complete the lab, and I had invited students to show me their results so that I could check what they had done, but these groups did not use the class time wisely and did not take advantage of my offer to check their work. In retrospect, when I assist students during group work, I am often hurrying to help groups who have their hands up for help. I think that perhaps I should also make sure I visit those groups who are shy of asking for help and have them show me their work and actively help them with parts they are unsure of. On the Central Limit Theorem Lab, the most common errors made were in not following directions, especially in describing the shapes of the graphs. Previous quarter's errors made in correctly stating the theoretical distribution were not present in this lab. Extra care was taken to make sure students understood the directions for this part.	
		Program Review Reporting Year: 2016-2017 **Target :** Target Met On the Probability Lab, all except 1 student (96.8%) of	**Enhancement:** I was very happy with the results of both Labs. In the future, I will make sure that I

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		students scored at least 20 out of 25 on the lab. The student who scored lower than 70% had not done several parts of the lab, and were not accurate in the counting parts of the lab. In addition, 71% (22 students) of the class received 22.5 points or better – the equivalent of an A. On the Central Limit Theorem Lab, 29 students (93.5%) scored at least 20 out of 25 on the lab. In fact, 54.8% of the students scored 22.5 points out of 25 or better – the equivalent of an A. The students who did not meet the objective on the lab scored 19 out of 26, the result of not answering the summary questions correctly and completely. (03/24/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** On the probability lab, the most common mistakes made were mostly careless errors in writing the theoretical probabilities, or errors in the counting the outcomes needed to compute the empirical probabilities. On the questions, all groups were able to identify that increasing the number of times the experiment was done would result in the empirical probabilities getting closer to the theoretical, but failed to mention that that was a consequence of the law of large numbers. The student who did not achieve a score of 80% or higher had not completed the lab. They had left large sections of the lab undone. I had given time in class over a full week to complete the lab, and I had invited students to show me their results so that I could check what they had done, but these groups did not use the class time wisely and did not take advantage of my offer to check their work. In retrospect, when I assist students during group work, I am often hurrying to help groups who have their hands up for help. I think that perhaps I should also make sure I visit those groups who are shy of asking for help and have them show me their work and actively help them with parts they are unsure of. On the Central Limit Theorem Lab, the most common errors made were in not following directions, especially in describing the shapes of the graphs. Previous quarter's errors made in correctly stating the theoretical distribution were not present in this lab. Extra care was taken to make	am more attentive to all of the groups and check that they actively working on the lab and on track to complete it in the time allotted. (03/24/2017)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		sure students understood the directions for this part.	
		Program Review Reporting Year: 2015-2016 **Target :** Target Met On the Probability Lab, 72.7% of students scored at least 20 out of 25 on the lab. Of those who did not score at least 70%, one group of 3 students scored 15 out of 25 (a D) and 2 groups of students scored grades of F on the lab. The students who scored lower than 70% had not done several parts of the lab, and were not accurate in the counting parts of the lab. In addition, 42.4% of the class received 22.5 points or better – the equivalent of an A. On the Central Limit Theorem Lab, 93.8% of students scored at least 20 out of 25 on the lab. In fact, 87.5% of the students scored 22.5 points out of 25 or better – the equivalent of an A. The students who did not meet the objective on the lab scored 16 out of 26, the result of not answering the summary questions correctly and completely. (06/13/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** On the probability lab, the most common mistakes made were mostly careless errors in writing the theoretical probabilities, or errors in the counting the outcomes needed to compute the empirical probabilities. On the questions, all groups were able to identify that increasing the number of times the experiment was done would result in the empirical probabilities getting closer to the theoretical, but failed to mention that that was a consequence of the law of large numbers. The students who did not achieve a score of 80% or higher had not completed the lab. They had left large sections of the lab undone. I had given time in class over a full week to complete the lab, and I had invited students to show me their results so that I could check what they had done, but these groups did not use the class time wisely and did not take advantage of my offer to check their work. In retrospect, when I assist students during group work, I am often hurrying to help groups who have their hands up for help. I think that perhaps I should also make sure I visit	**Enhancement:** Although I was very happy that the majority of the class had done very well on this lab, I was very concerned that so many students (9 students) had not completed the lab and, thus, received low scores on the lab. In the future, I will make sure that I am more attentive to all of the groups and check that they actively working on the lab and on track to complete it in the time allotted. (06/13/2016)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		those groups who are shy of asking for help and have them show me their work and actively help them with parts they are unsure of. On the Central Limit Theorem Lab, the most common errors made were in not following directions, especially in describing the shapes of the graphs. Previous quarter's errors made in correctly stating the theoretical distribution were not present in this lab. Extra care was taken to make sure students understood the directions for this part.	
		Program Review Reporting Year: 2014-2015 **Target :** Target Met 78% scored B or higher on Probability Lab. 72% scored B or higher on Central Limit Lab (10/14/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The students appeared to have fun with both of these hands-on labs.	
		Program Review Reporting Year: 2013-2014 **Target :** Target Met On the Probability Lab, all except two students (95%) scored at least 20 out of 25 on the lab. One of the two students students did not turn in the lab. The other student scored 16.5 out of 25. In addition, 16 students (45.7% of the class received 22.5 points or better – the equivalent of an A. On the Central Limit Theorem Lab, all except two students (95%) scored at least 20 out of 25 on the lab. In fact, 82% of the students scored 22.5 points out of 25 or better – the equivalent of an A. The two students who did not meet the objective on the lab scored 16 out of 26, the result of not answering the summary questions correctly and completely. (06/24/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** On the probability lab, the most common mistakes made were mostly careless errors in writing the theoretical probabilities. On the questions, all groups were able to identify that increasing the number of times the experiment was done would result in the empirical probabilities getting closer to the theoretical, but failed to mention that that was a consequence of the law of large numbers.	**Enhancement:** : I was very happy with the results of the lab. Next time, I will emphasize the Law of Large Numbers more in my lectures. (06/24/2015)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		On the Central Limit Theorem Lab, the most common errors made were in not following directions, especially in describing the shapes of the graphs. Previous quarter's errors made in correctly stating the theoretical distribution were not present in this lab. Extra care was taken to make sure students understood the directions for this part.	
		Program Review Reporting Year: 2013-2014 **Target :** Target Met On the Probability Lab, all students scored at least 20 out of 25 on the lab, except for 1 group of two students who scored 19 out of 25. In fact, the results were very good. Out of the 11 lab projects submitted, 9 groups scored 22.5 or higher (the equivalent of an A), with one group scoring 25 out of 25. On the Central Limit Theorem Lab, all students scored at least 20 out of 25 on the lab, except for 1 group of two students who scored 19 out of 25. In fact, with the exception of the group just mentioned, all students scored 23 or higher (the equivalent of an A) on the lab, with 3 groups scoring 25 out of 25. (07/01/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** On the probability lab, the most common mistakes made were mostly careless errors in writing the theoretical probabilities. On the questions, all groups were able to identify that increasing the number of times the experiment was done would result in the empirical probabilities getting closer to the theoretical, but failed to mention that that was a consequence of the law of large numbers. On the Central Limit Theorem Lab, the most common errors made were in not following directions, especially in describing the shapes of the graphs. Also, students did not fully understand how to write the theoretical distribution for Xbar, using the standard deviation for the samples, rather than that of the population in writing the distribution. This is a common error.	**Enhancement:** : I was very happy with the results of the lab. Next time, I will emphasize the Law of Large Numbers more in my lectures. In the Central Limit Theorem Lab, I will emphasize how to write the distribution for averages when we discuss the instructions for the lab. (04/01/2014)
	exam on chapters 4, 5, 6, and 7	**Program Review Reporting Year:** 2015-2016	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	covering discrete and continuous sampling distributions **Target for Success:** 70% student pass rate	**Target :** Target Met Class average exam score of 79%. (11/10/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** While most students were successful, there are a handful of students that need to recognize the need to set aside adequate time for studying and reviewing material.	
		Program Review Reporting Year: 2014-2015 **Target :** Target Not Met 15 out of 31 students scored below the passing grade. (02/17/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Need to do more to encourage students to study for this exam, need to emphasize in class the level of difficulty that they need to master.	
		Program Review Reporting Year: 2014-2015 **Target :** Target Met Average score of 76% (11/06/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** comparison and review of results	
		Program Review Reporting Year: 2013-2014 **Target :** Target Met 83% of students passed the exam with a class exam average score of 85%. (11/12/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I was quite pleased with the results, especially with the 8 students who got 100%.	
	On a technology based activity, students will compare sampling distributions to theoretical distributions.	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met 17 of 24 students successfully completed the activity. (03/13/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I will revise the instructions based on questions students asked.	
		Program Review Reporting Year: 2014-2015 **Target :** Target Met 60% of students successfully completed a project where sampling distributions were compared to theoretical distributions. (05/19/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Some students had a hard time following written instructions for	**Enhancement:** Next time, I will carefully go over the instructions in class and point out areas where students mis-understood what to do, In addition, I will re-write parts of the activity to rewrite and highlight instructions students

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		this activity.	have had trouble understanding. (05/28/2015)
		Program Review Reporting Year: 2013-2014 **Target :** Target Met 72% of students were able to explain variation in sampling. 61% were able to explain how repeated sampling draws results closer to the original distribution. (01/31/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** For future use of this project, I will update the questions to be more clear of what is being asked.	
	Project - Students will describe their sampling method for a project and then by completing a relative frequency table determine the appropriate probabilities. **Target for Success:** 90% of the groups will be 90% or better on the project.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met Students did quite well in describing their sampling method. There were some minor problems with the frequency tables since some had too many intervals. (05/05/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I need to spend more time emphasizing the number of intervals on freg tables and histograms. Having more than 5-6 with a sample of 30 - 50 can lose the shape of the distribution.	
	Laboratory Project - Students worked in groups on a comprehensive review of probability topics. Students were asked to finish by themselves over 3 days. **Target for Success:** At least 70% of students get 70% or better.	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met Students were given several probability problems using two-way tables. Students needed to be able to distinguish marginal, joint and conditional probabilities, be able to determine if events were independent and interpret results as if doing a more formal hypothesis test. 32 of 35 (91%) students successfully complete the task. (03/18/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Most students understood this concept, but some needed some help. Independence is always a challenge in Stat	**Enhancement:** Keep the data relevant by using the most recent studies. (03/18/2019)
		Program Review Reporting Year: 2014-2015 **Target :** Target Met 14 out of 19 students successfully completed the assignment (03/27/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students have trouble identifying when a probability question is conditional or not.	
	Other - Students work in groups and determine through repeated trials	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	the empirical probability of the six different landing positions of a small toy pig from the game Pass the Pigs. Students than compare results with other students and explore variance of random variables. **Target for Success:** 85% of class successfully complete assignment	Students, working in pairs, rolled and tracked the 6 different positions the pig die landed. They then built relative frequency tables. (12/19/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students were able to see that the pig die positions are not of equal probability like a normal cube die. The students then see the value of repeated trials to get an estimate of each choice's probability.	
		Program Review Reporting Year: 2014-2015 **Target :** Target Met 100% of students successfully completed this fun project. Students were able to recognize that different groups had different results. (06/12/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** This project originally came from Statway and we agreed that this project is equally appropriate for this SLO of Math 10	
	Exam - Course Test/Quiz - Successful passing of first exam. **Target for Success:** 70% of students achieving a passing score. **Comments/Notes:** 74% of student obtained a passing score, including 41% of students who received A's.		
	Demonstration - Students will generate random data from a uniform distribution in blocks of 20. Students will then take sample means of each block and then graph the means and recognize the components of the central limit theorem for means. **Target for Success:** 90% completion rate	**Program Review Reporting Year:** 2015-2016 **Target :** Target Met 100% of students successfully completed the project. (06/22/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students were correctly able to determine that the pdf of X-bar was normal, with the same mean and lower spread than the original uniform data.	**Enhancement:** Try using an exponential distribution next time. (06/22/2016)
	Exam - Course Test/Quiz - Exam 2: deals with computing probability and choosing correct probability distribution **Target for Success:** 70% pass rate	**Program Review Reporting Year:** 2015-2016 **Target :** Target Met 24 out of 34 students passed the exam (>70%) or 70.5% pass rate (06/22/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students did well on this exam but struggled with expected value of a	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		probability distribution function for game of chance, need to focus more on defining random variable X and computing pdf table	
	Exam - Course Test/Quiz - Quiz 4 on continuous random variables, which tested students on calculating probabilities and sketching distributions. **Target for Success:** 80% or higher of students will earn a 75% or higher on the quiz.	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met 24/30 students or 80% of students received a 75% or higher on this quiz. (06/28/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students who struggled had a hard time with the exponential distribution.	
		Program Review Reporting Year: 2018-2019 **Target :** Target Met 31/38 students (81%) got a 75% or higher on this quiz. (03/29/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** While this target was met, I was hoping for higher achievement. In the future, I will focus more on calculating probabilities for various distributions.	
MATH10_SLO_3 - Collect data, interpret, compose and defend conjectures, and communicate the results of random data using statistical analyses such as interval and point estimates, hypothesis tests, and regression analysis. **SLO Status:** Active	**Exam - Course Test/Quiz -** Interpret a confidence interval for a population parameter in context of the problem with a complete sentence. **Target for Success:** The combined student scores in 5 Math 10 sections should total at least 70% of possible points assigned for the problem.	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met 18 out of 21 students demonstrated correctly writing a complete sentence for a population parameter in the context of a problem. (11/16/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Pleased with so many getting this correct, I plan to emphasize more the writing component of the CI in later quarters.	**Enhancement:** Add more practice on writing sentences to explain confidence intervals. (11/16/2017)
		Program Review Reporting Year: 2012-2013 **Target :** Target Not Met 47% of total points were awarded for student answers in the 5 Math 10 sections. (11/16/2012) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Less than half of possible points (43%) were awarded for interpreting the results with a complete sentence. Students omitted required details, made incorrect links between the resulting confidence interval and population proportion. In conclusion, students performed excellently with numerical computations, adequately with graphical representations and poorly with verbal interpretations.	**Enhancement:** AI will provide additional examples of written interpretations to students. Also, I will require students to write more sentences to interpret results both in class and in homework assignments. (04/20/2013)
	Project - Using data provided to	**Program Review Reporting Year:** 2012-2013	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	them by the instructor in addition to data collected by them during an earlier project, students will design and conduct 8 hypothesis tests. Students will need to successfully state the hypotheses in context and in symbols, choose the correct model, run the test using computer software, make the correct decision, compare results to appropriate graphs, and write a two page research report analyzing the conclusions in non-statistical language. **Target for Success:** 90% of students successfully complete project.	**Target :** Target Met 90% of students turned in a satisfactory project, 10% of projects were deemed unsatisfactory (12/12/2012) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Most students successfully completed the project, and were especially proficient in appropriate use of ANOVA, Regression and Chi-square Test of Independence Models - topics that were stressed in the course due to the critical necessity of these models in research. Students were also able to create comparative graphs and tables that were consistent with results. The most common error was failure to recognize the difference between Dependent and Independent sampling on one of the eight hypothesis tests. The students who did not succeed failed to turn in a complete project so their performance cannot be assessed.	**Enhancement:** Development examples and exercises that help students understand the difference between dependent and independent sampling. (04/15/2013)
	Exam - Course Test/Quiz - A final exam question where students are to perform a hypothesis test on given data. **Target for Success:** At least 75% of students will achieve a score of 75% or better on the assessment question	**Program Review Reporting Year:** 2012-2013 **Target :** Target Not Met Out of 50 students 28 correctly completed a question on the final exam. (04/11/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students continue to have trouble identifying when to use a t-test versus a z-test. They are confused about when they have the parameter value versus the statistic value.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Met Final Exam Question A tire manufacturer claims that his tires last at least 60,000 miles. To test this claim, we sample 125 tires and find the lasted, on average, 62,000 miles with a standard deviation of 800 miles. there were four questions associated with this question: What is the null hypothesis: What is the appropriate test for this problem:	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		What is the p-value for this sample: At a 1% signficance level, which conclusion is most appropriate Out of 152 total questions there were 137 correct answers or 90% correct. (03/26/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Based on the above data, students successfully understood the SLO	
		Program Review Reporting Year: 2012-2013 **Target :** Target Not Met Out of 30 students, 18 achieved a score of 75% or better on this question. (01/15/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students struggled with identifying the type of hypothesis test to complete in a given situation. Following that, students lacked proper notation to complete the test.	**Enhancement:** More guided practice will be included to aid the students in being able to find the appropriate work to complete. (01/15/2013)
	Laboratory Project - Students design and run using computer software hypothesis tests. Students must then state valid conclusions. Students must choose the correct model and check the assumptions needed for the chosen model. **Target for Success:** 80% completion	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met 100% of students completed assignment, although some students had difficulty with design and conclusions (03/23/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Discussed with a colleague ways to improve the lab and how to use Minitab.	**Enhancement:** More time spent on design and conclusions of hypothesis testing (03/23/2013)
	Exam - Course Test/Quiz - Using bivariate data, determine and graph the best fit line, test if the correlation coefficient is significant, predict values of the dependent variable, and find the percent of variation in the dependent variable that is not explained by the independent variable. **Target for Success:** At least 65% of students with passing scores	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met 68% of students with passing scores (06/21/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students need to spend more time on homework assignments and hands-on worksheets.	
	Other - Group work - students should discuss various research questions and design hypotheses	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met 33 out of 35 (94%) of students were able to correctly	**Enhancement:** Incorporate the Airbnb study data since it was so popular in the descriptive statistics

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	tests, choosing appropriate models and sample sizes. **Target for Success:** 90% successfully complete lab	choose the correct models for the class. Students worked in pairs. (03/18/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Their was initial some confusion about the difference between dependent and independent sampling, but after practice most students understood and were able to conduct the appropriate tests.	section (03/18/2019)
		Program Review Reporting Year: 2015-2016 **Target :** Target Met Students were given a variety of research questions and had to design the experiment. Models included one and two population test of mean and proportions, dependent sampling models, categorical data tests, regression and ANOVA. (04/24/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students successfully completed the group work and were able to effectively communicate their results.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Met 93% completed lab (06/24/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** This was a very successful group activity in that students were required to be creative in their design of experiments. Although students often had difficulty in choosing the correct model, the collaborative effort and interaction with the facilitating tutors made this activity an excellent learning activity and improved the results of the later projects.	**Enhancement:** Add different examples using data from current events. (04/24/2016)
	Project - : Students completed a Hypothesis Testing Project. The found an article that made a claim about a population mean or proportion, made a hypothesis about whether they thought that their own study would show the actual mean or proportion to be higher or lower, collected data, and then conducted a hypothesis test. The project was worth 50 points. Students were assigned 5 points for	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met 31 students (93.9%) scored at least 39 points out of 50 on the project. 13 students(39.4%) scored at least 45 points – the equivalent of an A. The two students who did not meet the objective scored 38 out of 50 points, just 1 point shy of the target. However, none of the groups received a perfect score on the project. There were fewer A projects than I had in previous years. Many of the projects had inconsistencies in their write-ups. Two groups had a mismatch between their summary and the solution sheets	**Enhancement:** Next time I teach Math 10, I will encourage them to consult with me about writing their summaries. I will also try to look at their summaries before the due date so that I can give feedback. (06/22/2018)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	submitting a project proposal, an additional 5 points for submitting their data, and 40 points for successful completion of the project itself. The write up for the project included a typed summary of their project theme and the results they obtained, a graph of their data, and the complete hypothesis test conducted. **Target for Success:** Success was defined to be at least 70% of students scoring 39 out of 50 or higher on the project (equivalent to a B)	they had submitted. I had, as usual, posted a sample A project from the previous year. This seemed to help, as most projects did have the required components. But, I had invited students to show me their write-ups for help in getting the maximum points. There was only one group who did this. (06/22/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The overall performance of the class was good on this project and the class met the target. But none of the groups did a perfect job on their project, despite having a copy of the rubric I would use to grade the projects, a posted sample of an A project from the previous year, and my invitation to have me look over their work so I could help them with their write up.	
		Program Review Reporting Year: 2016-2017 **Target :** Target Met The project results were very good. 25 students (80.6%) scored at least 39 points out of 50 on the exam. 21 students(67.7%) scored at least 45 points – the equivalent of an A. There were 2 project groups who had submitted a final project that was not consistent with what they had proposed to do. One students had failed to turn in her project proposal on the due date. 2 groups had some parts of the final project write up missing. Overall, however, the quality of the projects were very good. (03/24/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Overall, I was pleased with the class performance on this project. The groups picked good topics for their project and I had some quite good submissions. This quarter, I brought two prior projects to class so that students could see what an "A" project looked like. Many students took pictures of the projects and I think it helped them to write their summary. I was disappointed in the two groups who had done their summaries incorrectly because their survey data summary was the opposite of the hypothesis they were trying to prove. As in the past, I invited students to show me their summaries for review prior to the due date and two or three groups did that. But, one of the groups with low scores did not use class time efficiently when I gave time to work on their project and did not ask for advice on their	**Enhancement:** Next year, when I teach Math 10, I will continue to give the students more examples of possible topics and also continue to show examples of past projects. I will also encourage them to consult with me about writing their summaries. I will also try to look at their summaries before the due date so that I can give feedback. (03/24/2017)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		write-up, even after I asked if they needed help. However, most of the projects were of good quality.	
		Program Review Reporting Year: 2015-2016 **Target :** Target Met All students (100%) scored at least 40/50 on the project. It was a huge success! (07/12/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Great project. I will use it again.	
		Program Review Reporting Year: 2015-2016 **Target :** Target Met The project results were very good. 25 students (78.1%) scored at least 39 points out of 50 on the exam. 14 students(43.75%) scored at least 45 points – the equivalent of an A. There were two students who did not submit a project and 3 students whose project was very incomplete. Another group received a C because some parts of the projects write up were missing. (06/13/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Overall, I was pleased with the class performance on this project. The groups picked good topics for their project and I had some quite good submissions. Some students did not know how to write their summary, despite the fact that I had posted two past projects that had done a good job of their summaries. I was disappointed in the groups that did not submit a project or whose projects was very incomplete. I had given a significant amount of class time on several days for the students to work on their projects. Unfortunately, these students were often absent. As in the past, I invited students to show me their summaries for review prior to the due date, but only one group did that. However, most of the projects were of good quality.	**Enhancement:** Next year, when I teach Math 10, I will continue to give the students more examples of possible topics and also give them examples of some means tests they could do. I will also encourage them to consult with me about writing their summaries. I will also try to look at their summaries before the due date so that I can give feedback. (06/13/2016)
		Program Review Reporting Year: 2013-2014 **Target :** Target Met The project results were very good. There was only one student who scored below 39 out of 50 points. This particular student had lost points because her group failed to turn in the project proposal and she did not turn in the data check. The remainder of the groups scored the equivalent of an A on their project.	**Enhancement:** : Next year, when I teach Math 10, I will continue to give the students more examples of possible topics and also give them examples of some means tests they could do. I will also encourage them to consult with me about writing their summaries.

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		(06/24/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Again, I was pleased with the class performance on this project. On my last assessment, I had noted that there was not much variety in the topics chosen for this project. That was not an issue this year. I found that the students did a good job in selecting their topics and I had a good variety of studies. I also had four different groups do Hypothesis Tests for Means, instead of proportions. I was pleased, since it is harder to find an appropriate article for a test of means and the data takes a little more work to gather. I had posted two examples of past projects and so the project write-ups were much better quality. I invited students to show me their summaries for review prior to the due date, but only one group did that. However, the projects were of very good quality.	(06/24/2015)
		Program Review Reporting Year: 2012-2013 **Target :** Target Met The project results were very good. There was only one group of four who scored below 39 points on the project, and they scored a 37.5. This particular group had lost points because they did not turn in a project proposal. The remainder of the groups scored above 39 points, with three groups scoring a perfect score. (07/01/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I was pleased with the class performance on this project. A few points, though, need some attention for next time. There were 4 or 5 groups who used the same study as a basis for their project. In the past, I had gotten more variety. I also did not have anyone do a means hypothesis test. Next year, I will give some examples of means tests and also give students more guidance about where to look for studies. I also found that students were not really sure how to write their summary, although I had posted an example of a past project as a model. I think the students are not used to writing a “technical” paper and could use a little more guidance about how to do it.	**Enhancement:** Next year, when I teach Math 10, I will give the students more examples of possible topics and also give them examples of some means tests they could do. I will also give them more guidance about writing their summaries. (07/01/2013)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	Exam - Course Test/Quiz - average of class score on exam 3, covering confidence intervals and hypothesis testing **Target for Success:** passing average class score of at least 65	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met Average class score was over 65% (03/20/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students should be encouraged to work through more homework questions to prepare for this exam.	**Enhancement:** Add more pre-exam assessment opportunities for students, so they can get feedback in what they need to work on. (03/20/2018)
		Program Review Reporting Year: 2014-2015 **Target :** Target Met Average class score of 77% (03/31/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Good results	
		Program Review Reporting Year: 2013-2014 **Target :** Target Not Met The class average was 64 on Exam 3. (12/03/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Missed the target by 1 point	
	Laboratory Project - Students completed a Hypothesis Testing technology based activity, which included 3 hypothesis tests - a z-test, a t-test and a proportions test. For each problem, students also had to find and graph the confidence interval. **Target for Success:** 70% draw correct conclusion, 80% find correct confidence interval.	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met 71% drew correct conclusion, 86% found correct CI (06/20/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Writing conclusions needs more examples in class.	**Enhancement:** Spend more time in class demonstrating, emphasizing and explaining the writing of conclusions./ (06/20/2017)
		Program Review Reporting Year: 2014-2015 **Target :** Target Met 95% found correct CI. 70% drew correct conclusion (06/16/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** For future classes, I should spend more time emphasizing what goes into writing a correct conclusion and tying it back to the original question posed. I ma happy the students were comfortable with confidence intervals and their interpretation.	**Enhancement:** For future classes, I should spend more time emphasizing what goes into writing a correct conclusion and tying it back to the original question posed. (06/16/2015)
		Program Review Reporting Year: 2014-2015 **Target :** Target Met 73% drew correct conclusion, 100% found correct confidence interval. (03/12/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Need to emphasis how to write conclusions more.	
		Program Review Reporting Year: 2014-2015 **Target :** Target Met	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		80% were able to draw a correct conclusion 92% found correct confidence interval (11/18/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Spent more time on hypothesis testing this quarter than before. Well worth it.	
		Program Review Reporting Year: 2013-2014 **Target :** Target Met 10 out of 11 were able to write a correct conclusion to the hypothesis tests, 9 out of 11 found the correct confidence interval. (03/11/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Next time, I plan to add an interpretation of the CI to the project.	
	Laboratory Project - Students will complete a lab on two pop mean and proportion and matched pair hypothesis testing. **Target for Success:** 85% of groups will get 90% of better on the lab.	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met Used NBA ball type data. Although some initial confusion, students were able to complete the lab. (Fall 2019) (12/12/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** no change needed	
		Program Review Reporting Year: 2013-2014 **Target :** Target Met Students did well on the Lab. There were a couple that, despite being told in the explanation of the lab, incorrectly did the matched pair hypothesis test as a test of two independent means. (06/16/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Not sure how to be more clear but will do a better job of explaining each of the parts of the lab next time so that students don't miss the matched pair hypothesis test.	
	Exam - Course Test/Quiz - Students will score an average of at least 75% on exam 3 which covers confidence intervals and hypothesis testing **Target for Success:** Average of 75%	**Program Review Reporting Year:** 2014-2015 **Target :** Target Met Exam average score of 81% (11/25/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** comparison of other class results	
	Laboratory Project - Students were provided data by the instructor and were asked to preform regressions analysis to arrive at the appropriate conclusions. Students were given a	**Program Review Reporting Year:** 2014-2015 **Target :** Target Met 16 out of 19 students successfully completed the assignment (03/27/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students have	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	complete rubric for grading and assigned group grades at the end. **Exam - Course Test/Quiz -** Average class score on exam 3 on hypotheses testing and confidence intervals **Target for Success:** At least an average passing score of 70%	trouble identifying outliers. It seemed more of a technology issue than an understanding issue, though, because they knew what formulas to apply but they were unsure how to find "s".	
	Laboratory Project - Students are given 6 different research questions and need to determine the appropriate model, design and conduct the hypotheses tests. Students must then write a brief research paper describing the results in non-statistical language. **Target for Success:** 90% successfully complete project.	**Program Review Reporting Year:** 2014-2015 **Target :** Target Met 92% of students successfully completed this project. (06/12/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Although students demonstrated an ability to choose the appropriate model and design and conduct the experiment, several students had difficulty in writing. It was suggested that a reading/writing tutor would be valuable for Math 10.	
	Exam - Course Test/Quiz - Successful passing of first exam. **Target for Success:** 70% of students achieving a passing score. **Comments/Notes:** 74% of student obtained a passing score, including 41% of students who received A's.		
	Exam - Course Test/Quiz - exam covering confidence intervals and hypothesis testing **Target for Success:** class average of at least 70%	**Program Review Reporting Year:** 2015-2016 **Target :** Target Met Class average of 75% on exam (11/24/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students whose native language is not English had a more difficult time with this exam.	
	Other - Group work - students will read several examples/descriptions of an experiment needed to be designed. Students will then, in discussion groups, determine the appropriate Hypotheses in word and parameters, and choose the	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met 5 examples requiring different models were chosen. Students must then be able to determine the correct model based on the parameter(s) being tested, the sampling method and the assumptions needed. (12/19/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** We discussed	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	appropriate model. **Target for Success:** mean of 80%	this assessment method at our MPS meeting since other instructors use similar assessments. Although the assignment required careful reading and critical thinking, the students were successful in completing this assignment.	
		Program Review Reporting Year: 2016-2017 **Target :** Target Met Mean score was 87% (06/22/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Discovery learning and productive persistence really works. Students talked about each design and were able through teamwork to figure out the correct design of experiment.	**Enhancement:** Add discovery learning and productive persistence to other activities. (06/22/2016)
	Exam - Course Test/Quiz - Final - Final included questions on regression analysis, point estimates/confidence intervals, and hypothesis **Target for Success:** 70% pass rate (C or better on final exam)	**Program Review Reporting Year:** 2015-2016 **Target :** Target Met 24 out of 31 students taking the final passed with a grade of C or better (06/22/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students did well on final, now goal is to retain more students from first day of class to final to improve aggregate pass rate.	
	Exam - Course Test/Quiz - Interpret a confidence interval for a population parameter in context of the problem with a complete sentence. **Target for Success:** At least 80% of the students score at least 75% on the quiz **Comments/Notes:** Target Met, Fall 2017		
	Laboratory Project - Laboratory Project: Students were provided data by the instructor and performed regression analysis to arrive at the appropriate conclusions. Students were given a complete rubric for grading. **Target for Success:** 70% with grade 80% or above.	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met 31 out of 34 students successfully completed the project. (06/20/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Using a rubric in Canvas was a huge help to the students.	**Enhancement:** Grading rubrics to be updated for other assessments. instructions to be enhanced to avoid common wrong answers. (06/20/2019)
	Laboratory Project - Students will	**Program Review Reporting Year:** 2018-2019	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	complete Lab 2 in R where they are required to create and interpret confidence intervals and determine if certain populations are statistically different based on confidence intervals **Target for Success:** 75% or more of students will earn an 80% or higher on Lab 2.	**Target :** Target Met 34/38 students successfully earned an 80% or higher on this lab. (09/20/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 2 of the students who did not meet this criteria ended up not coming to class, thus the reason for their zero.	
		Program Review Reporting Year: 2018-2019 **Target :** Target Met 90% of students were able to earn a 80% or higher on Lab 2. (06/28/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** This was an MPS class so success rates may be higher due to increased supports in class.	

MATH 11:Finite Mathematics

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MATH11_SLO_2 - Compare, evaluate, judge, make informed decisions, and communicate results about various financial opportunities by applying the mathematical concepts and principles of the time value of money. **SLO Status:** Active	**Exam - Course Test/Quiz -** Evaluate the percentage of students passing the exam **Target for Success:** 75% of students passing the exam	**Program Review Reporting Year:** 2016-2017 **Target :** Target Not Met Just under 25% of students passed this exam with a passing grade of 68% of possible points earned. (09/26/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Results for financial calculations were particularly poor this quarter. Students appear to have a hard time understanding what a particular problem is asking and whether a present or future value is needed, as well as whether there are periodic payments or a single lump sum payments. Students need more practice and guidance in understanding what the problems are asking. Students need to be encouraged to understand the problem instead of just finding a formula to apply without taking the time to understand the situation described in the words of the problem.	**Enhancement:** 1) Students need tutorial help with finance calculations. The tutorial center is not able to find sufficient number of tutors to help with the financial topics in Math 11. 2) In future quarters I will stress use of timelines more to help students understand the nature of the payments in financial problems and to understand the timing of the payments and calculations, in order to improve their ability to interpret what the questions are asking. (09/26/2017)
		Program Review Reporting Year: 2016-2017 **Target :** Target Met 84% of all enrolled students passed the exam. 88% of all students who remained enrolled to finish the class passed the exam (06/08/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 84%-88% of student passed the exam. Student difficulties with this material include 1) understanding financial situations - some of the younger students with less life experience do not have personal experience with finance and have difficulty understanding the financial situations described in the problems; 2) attendance - in spring quarter student attendance is lower than other quarters and students who don't attend then don't learn the material adequately; 3) students lack appropriate tutoring in this course due to lack of availability of tutors for Math 11 due to hiring restrictions for tutors. Result of former enhancement: Expanding the of use of timelines to understand financial situations has helped students understand the timing of financial calculations better.	**Enhancement:** Additional tutors in the Math Science Tutoring and Resource Center who can tutor Math 11 Finite Math would be every helpful. Because we can only hire full time students to be tutors, and because most Math 11 students transfer shortly after completing the class, and because most Math tutors are Math or Science majors who don't normally take Math 11 Finite Math which is business oriented, the tutorial center rarely has Math 11 tutors available. Hiring procedures should be reviewed or changed as possible to increase the number of tutors for Math 11, to help students succeed in Math 11 and to help them prepare for Math 12 to achieve their Business

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
			Associate Transfer degrees that include these courses. (06/08/2017)
		Program Review Reporting Year: 2012-2013 **Target :** Target Met Over all 81%, 30 of the 37 students, passed the Exam, 76% identified the problems correctly, 86% computed the answers correctly, 69% gave correct interpretation of the answers. (07/14/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 30 of the 37 students passed the exam. 76% of students were able to determine whether problem involved an annuity or lump-sum situation. They were also able to recognize Present and Future Values as well as Sinking Fund and Installment Payment categories. But only 69% could choose the situation that was more profitable. They also had trouble approximating effective interest rate without performing the actual computation.	**Enhancement:** I will try to choose problems and examples that better illustrate the ideas and concepts involved, and have my students spend more time understanding and explaining financial situations. I will put more emphasis in having them a) describe in their own words each situation, and b) after computing the answers explain their results. (07/14/2013)
		Program Review Reporting Year: 2012-2013 **Target :** Target Met On Exam 1, 15 out of 20 passed the exam, 75 % passed. The distribution of test scores ranged from 17 to 115 (extra problems/points are available on exam). The average was 73, and the median was 78. Four of the 5 who did not pass scored well below 50. (04/17/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The majority of students are capable of handling the math involved in the formulas for the various types of financial problems. There are certain types of problems that do seem to cause difficulty for a fair number of students. I have not used interpretative types of questions on this exam, where students have to write a sentence or two of explanation and interpretation of results. I will find a way to incorporate such questions in future exams.	**Enhancement:** I have not used interpretative types of questions on this exam, where students have to write a sentence or two of explanation and interpretation of results. I will find a way to incorporate such questions in future exams. (04/17/2013)
		Program Review Reporting Year: 2012-2013 **Target :** Target Met On Exam 2, 28 of the 36 student passed. That is, 78% passed. (01/07/2013)	**Enhancement:** I will provide more examples for interpretation of results and have them write in full sentences description of results

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		Reflection (CLICK ON ? FOR INSTRUCTIONS): 84% 0f the students were able to do perform calculations and come with the correct answers, but only 68% were able to interpret the answers they obtained. I need to make them write in full sentences the meaning of their results on all classwork, homework, and test problems.	both in class and homework. (11/07/2012) **Follow-Up:** I started to put more emphasis on both the statement of the problem, as well as the interpretations of the results; as a result, the students did better on that description and interpretation part of the tests. (01/11/2013)
	Exam - Course Test/Quiz - I will use a quiz to evaluate the students understanding of the above SLO **Target for Success:** 60% of the students will pass the quiz	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met 78% of the students passed the quiz and it was successful (12/13/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I was happy with the results. The quiz was a great evaluation of the students' knowledge	
MATH11_SLO_1 - Identify, evaluate, and utilize appropriate linear and probability optimization models and communicate results. **SLO Status:** Active	**Exam - Course Test/Quiz -** Percent of students passing exam. **Target for Success:** 75% of students passing exam	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met 83% of students passed the quiz evaluating using linear optimization models (linear programming). (09/26/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** This quarter I moved this topic to the end of the quarter. Linear programming was covered in the last two weeks of the quarter. At that point, some students who were struggling had already withdrawn from the class. Also, this quarter we completed the linear programming lab before the quiz, whereas in previous quarters the students completed the lab after the quiz. Due to placement of material in the quarter and timing of holidays, etc, the timing of the lab (or exam) vs the quiz varies in different quarters. I think that completing the lab before the quiz gave students better familiarity with the topic and helped improve their performance on the quiz	**Enhancement:** The tutorial center is not able to find enough tutors for Math 11. This particular topic, linear programming, is not covered in any other course in our Department, and therefore the students are not able to find sufficient tutoring help in this topic. It would be helpful if the Tutorial Center were to have some other way to hire tutors other than only full time De Anza students because it is historically not possible to find enough students who meet tutor eligibility requirements (full time De Anza student) who are also qualified to tutor Math 11. (09/26/2017)
		Program Review Reporting Year: 2016-2017 **Target :** Target Met 76% of students passed the exam with a grade of 68% of	**Enhancement:** Students need more practice understanding the duality relationship and simplex

		points possible on the exam (09/26/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students were reasonably adepts at interpreting linear programs from word problems, writing them up in standard form, solving geometrically for both maximization and minimization problems, and using the simplex method to solve standard maximum problems. Students tended to have difficulty setting up and solving standard minimum problems using duality with the simplex method. Problems in this section of the course are long and involved and require many steps, and some students do not do the homework to practice this in this section as they are frustrated by the (unavoidable) length of some of the problems. Due to the length and complexity of the algorithms it is also harder for students to "get it" if they do not do adequate practice, compared to other topics in this course with simpler shorter types of problems.	method process applied to minimization problems. In the future I will place additional stress on this topic to help make it clearer for students to understand. Students need more Math 11 tutors in the Math Tutoring Center. The tutors who are our full-time students who are tutors mostly do not take Math 11 and are not able to effectively tutor this topic in Math 11. More Math 11 tutors are needed. Perhaps another method of hiring tutors is needed other than only full-time students, since that method of hiring tutors leaves tutor shortages in some classes that do not have as many students enrolled in it. Tutors hired who are math students at graduate school for example, could help fill in the gaps in tutoring that we have when hiring only full time De Anza College students as tutors. (09/26/2017)
		Program Review Reporting Year: 2012-2013 **Target :** Target Met Over all 81% of the students passed Exam 1, but only 70% passed Exam 3. In Exam 1, 76% gave correct interpretation of the answers, but in Exam 3, fewer than 62% interpreted the problems and solutions correctly. (07/14/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Probability is a difficult subject and students have trouble not only understanding counting principles, but also complicated probabilistic models. One way to overcome this is to practice enough drill problems to develop manipulative skills and to practice a large number of applications in order	**Enhancement:** We will practice more drill as well as application problems. I will not only have them double their efforts in solving more problems, but have them explain in full sentences description of their results. (07/14/2013)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		to learn how material is used both in business and the life and social sciences.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Not Met 13 of 21 students passed exam 3. 62 % (04/17/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Though there were approximately the same number of "mechanical" and "application" problems on this exam (which dealt with max/min and optimizations) as on the first exam (finances), students had more difficulty interpreting the information presented in the application problems.	**Enhancement:** I may have to first provide some written questions whereby students have to read through the problem to discern the various information given in the problem, then have the students solve the problem. i.e., a set of questions requiring some short-answer phrase or statement that indicates the student is reading and interpreting the question correctly, before the student attempts the mathematics to solve the problem. (04/17/2013)
		Program Review Reporting Year: 2012-2013 **Target :** Target Not Met On exam 2, (max/min and optimization problems) 13 of 21 students passed the exam: 62 % (04/17/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** There were roughly the same number of "mechanical" and "application" problems as on the first exam (though a different topic), but students seemed to have more difficulty interpreting several types of optimization and other application problems.	**Enhancement:** I may need to first break down a problem into a series of questions that ask students to discern the various pieces of information the problem presents, before they go directly into solving the problem. (04/17/2013)
		Program Review Reporting Year: 2012-2013 **Target :** Target Met Over all 76% of the students passed the Exam 81% gave correct numerical answers to the problems 69% gave correct interpretation of the answers (10/15/2012) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** SLO 1: 27 of the 37 students passed the exam. 80% of students were quite competent in interpreting the problem and carry out the computations, and 74% were able to explain the results.	**Enhancement:** I will provide more examples for interpretation of results and have them write in full sentences description of results both in class, in homework, and in tests. (10/17/2012) **Follow-Up:** The students did improve in interpreting the problems and describing the results because of my efforts in making them write in full

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
			sentences what the problem stated and what was asked. (01/11/2013)
	Exam - Course Test/Quiz - I will evaluate this SLO on Exam 1 **Target for Success:** 60% of the students will pass this exam	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met 65% of the students passed this exam (12/13/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I gave critical points that had decimal solutions. I will change this approach next time and will make sure the values are integers.	

MATH 114:College Math Preparation Level 3: Intermediate Algebra

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MATH114_SLO_1 - Evaluate real-world situations and distinguish between and apply exponential, logarithmic, rational, and discrete function models appropriately. **SLO Status:** Active **Planned Assessment Quarters:** 2012-13 3-Winter **Outcome Creation Date:** 09/18/2012	**Exam - Course Test/Quiz -** Look at student performance on three applicable problems on the final. **Target for Success:** Success would mean more than half the class performed well on at least two of the three problems.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met 30 out of 49 students performed well on at least two out of 3 relevant final questions. (04/19/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Target was met . Students who met target were for the most part the ones who ended up passing the course. Students that struggled with this SLO were mainly ones that didn't pass class, suggesting that they had other areas of deficiencies that made it hard for them to meet this particular SLO.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Not Met Out of 39 students taking the final, 9 performed well on all 3 problems, 9 performed well on 2 out of 3 problems, 10 performed well on 1 out of 3 problems, and 11 did not perform well on any of the problems. (01/30/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** In future quarters I will spend more time making sure my students can apply the various function models to real-world situations. Exponential functions, in particular, were quite challenging for my students this quarter.	
	2 questions on the first test where students must figure out which of the 4 models to apply. **Target for Success:** Two thirds of the students will get at least one question correct and half will get both correct.		
	Exam - Course Test/Quiz - Two relevant questions on final exam. **Target for Success:** 70% of class will set up both models correctly.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Not Met 17 out of 49 students met target. (04/19/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Target was not met. Students could have benefited from doing a class project or in class activity centered around modeling using all the different functions that were covered during the quarter.	
	Project - Project - Partner project	**Program Review Reporting Year:** 2012-2013	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	dealing with mortgage calculations. Use of rational equation to find monthly payments, total payments and total interest paid of the loan. **Target for Success:** 100% completion of project by all students. 85% average class score on project.	**Target :** Target Met All students (i.e. pairs) completed the project. Class average score was well over 85%. (11/15/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Still some issues with following directions so will edit the project to make things clearer. (I hope!!)	
	Project - 1) Do groups working on the project need much mathematical guidance 2) Do all groups complete the project 3) Grade on the Project **Target for Success:** 1) Group work does not need much mathematical guidance 2) All groups turn in a project with at least 75% completion 3) All groups earn a 'C' or better	**Program Review Reporting Year:** 2013-2014 **Target :** Target Not Met 1. Out of 20 groups (2-3 students) 4 groups needed assistance. However, I only observed assistance during class meetings. More groups may have sought assistance from such resources as our tutorial center. 2. All groups did turn in a project with at least 75% completion. 3. All but 2 groups earned a 'C' or better. In these 2 less satisfactory projects the work was mostly complete but incorrect and very messy. (12/30/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 1. I would encourage students to write down any assistance and type sought by their group. I would use this to improve the project and/or focus more on teaching certain topics. 2. Target met 3. Instead of individual group performances a better measure might be overall or average percent based on all projects.	
	Exam - Course Test/Quiz - test 3 number 1, 6, 13 and 18 **Target for Success:** 70% of the class do these questions correctly	**Program Review Reporting Year:** 2014-2015 **Target :** Target Met 1 and 6 are related to exponential. 13 related to log, and 18 related to sequencce (03/21/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** students who practiced homework did well on the questions	
	Project - Score on collaborative projects **Target for Success:** complete with score 90% or better	**Program Review Reporting Year:** 2014-2015 **Target :** Target Not Met In a class of 33 students with 12 groups, 2 groups did not turn in both projects 3 groups turned in only 1 of the two projects Of the projects that were turned the average percent for the first project on drugs was 83.6%. The average percent on the second project (pH and dBs) was 77.8%. (01/07/2015)	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		Reflection (CLICK ON ? FOR INSTRUCTIONS): Some students complained about others not doing the work within the group. Also, no one within groups necessarily had definite roles and responsibilities. Instead of letting students form their own groups I will create groups and give students different responsibilities within the groups. I may also create a short open ended question to attach to each project at the end that requires a short presentation by the group.	
	Exam - Course Test/Quiz - exam 1, exam 3 and final exam questions of applications these functions **Target for Success:** 70% of the students can answer related questions correctly	**Program Review Reporting Year:** 2015-2016 **Target :** Target Met Average of 74% of my two classes answered related questions correctly (12/17/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students in my MW class were more motivated than my M-F class. MW class average is 78% and the other is 70%	**Enhancement:** Course assignment encouraged students to take in charge in learning. Exams measured well what they learned. There were students registered for the classes, but hardly bothered to come to class and to do homework, which lowered the class average. (12/17/2015)
	Exam - Course Test/Quiz - Final exam question: motion problem requiring the use of rational model. **Target for Success:** At least 75% of the students will earn a 70% or higher on this question.		
	Exam - Course Test/Quiz - Students were presented with an absolute value problem that included a distance function (distance from San Francisco) and were asked to use that function to analyze the distance at different times on a trip from Los Angeles to Truckee, CA, and determine required travel times for specific distances. **Target for Success:** Mean score of 70% correct for that specific problem.	**Program Review Reporting Year:** 2015-2016 **Target :** Target Not Met Mean score was 56.4% correct for specific problem. (04/17/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students were given several opportunities in class to engage with the material from analytical, graphical and computational perspectives. Some of the wording in the problem may have been misleading. Not providing a graphic with the relative locations of the cities may have led to confusion and/or misunderstanding.	**Enhancement:** Change the wording of the problem to make the meaning more explicit. Provide a graphic of the state of California that includes the relative locations for all three cities referenced in the problem. (04/17/2016)
	Exam - Course Test/Quiz - On the final exam, I asked the students the	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met	**Enhancement:** In the future, I will probably have the students

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	following: Your local coffee shop, Sconehenge Bakery, charges $1.50 for a cup of coffee if you use their reusable Sconehenge mug rewards program. The mug costs $5.00. The function A(x) = (1.5x + 5)/x gives the average cost in dollars for a cup of coffee using the rewards program. Compute A(4) and interpret your answer. How many cups of coffee would you need to purchase in order to have an average cost of $2.00 per cup? **Target for Success:** I wanted to see at least 50% of the class answer this question correctly.	Around 64% of the class answered this question correctly. (08/30/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I was fairly happy with how the students answered this question. There were more students than I expected who did not even attempt to compute A(4) which would have given them at least a few points on this question.	actually construct the average cost function in the problem. I will also try to do more examples of solving applications of rational equations in class. (08/30/2018)
	Exam - Course Test/Quiz - The final exam for Math 114 in Spring 2019 consisted of problems (not limited to) involving exponential, logarithmic, and rational functions. Students are asked to evaluate logarithmic expressions with various bases (other than e or 10) in an application (earthquake problem involving magnitude and intensity), simplify rational functions by factoring, and sketch graphs of exponential functions from growth/decay while explaining any nonrigid transformations. Each of these three problems were scored out of 5 points (based on accuracy and attempt). **Target for Success:** 70% of students would earn at least 11/15 points combined between these three problems.	**Program Review Reporting Year:** 2018-2019 **Target :** Target Not Met Of the 24 students who took the exam, 16 were able to earn at least 11/15 points combined between the three problems. (06/18/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** My target of 70% was not met. It seems that there may have been some confusion about how to work with logarithmic expressions in terms of an application problem. While most of the students were successful in working with logarithmic functions in other problems of the exam, there seems to be some trouble when it was applied to a real-world situation, such as earthquakes.	**Enhancement:** I should have spent more time covering logarithmic expressions in class. Because it was covered closer to the end of the quarter, I did not have as much time. (06/18/2019)
MATH114_SLO_2 - Analyze, interpret,	**Exam - Course Test/Quiz -** Looking at	**Program Review Reporting Year:** 2012-2013	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
and communicate results of exponential, logarithmic, rational, and discrete models in a logical manner from four points of view - visual, formula, numerical, and written. **SLO Status:** Active	the number of students who scored at least 75% on the final exam. **Target for Success:** Two thirds of the class.	**Target :** Target Not Met 23 out of 39 students taking the final exam score at least a 75%. (05/03/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students had a hard time with cumulative material and being able to discern how problems are different, and when to apply certain rules.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Not Met Out of a class of 34 students, 13 scored at least 75% on the final exam, and 21 did not. (02/04/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Not enough of the class met this objective. I will introduce some different teaching methods the next time I teach this course.	
	Project - Give a project where students in small groups have to analyze the data and come up with the answer by using one of the 4 models. They then present the data from 4 points of view. **Target for Success:** At least 2/3rds of the projects correctly analyze and present the data using the correct model and with 4 points of view. **Comments/Notes:** A murder mystery!		
	Exam - Course Test/Quiz - Look at performance on relevant problems on final exam. **Target for Success:** 75% of class answer question correctly.		
	Project - Partner project dealing with mortgage calculations. Use of rational equation to find monthly payments, total payments and total interest paid of the loan. **Target for Success:** 100% completion of the project. 85% class average on the project.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met All students completed the project. Some trouble getting the correct mortgages but class average well above 85% (11/15/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Will edit the project to be more clear to students as to what to do.	

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
		Program Review Reporting Year: 2012-2013 **Target :** Target Not Met 100% of the groups turned in the project on time. Unfortunately, many were poorly done with a class average of 76%. Even removing the one project that was a total mess only brought the class average up to 81%. (05/03/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The results were below target mainly because of the number of students who didn't even bother to do one whole section of the project (worth 10 points). I sensed a real lack of dedication (or realization as to how much this project was worth) and commitment to completing the assignment by many students. I should have spent more time with class on the idea of buying a house and what it means to make mortgage payments. Should have spent more time talking about what a realistic payment would be based on interest and loan amount.	
	Other - Grade on Two Worksheets (Modeling Using Exp and Log Functions) **Target for Success:** 1. Everyone turns in at least one complete worksheet 2. At least one worksheet is well done (neat, correct, written well) 3. The Average percent on each worksheet is 70% or more. **Comments/Notes:** Worksheets incorporate numerical, written results, graphing and function evaluations.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Not Met 1. Out of 69 enrolled in two classes 58 students turned in at least one worksheet. Of the 11 who did not 7 stopped attending after the 8th week. 2. Of the 58 papers turned in for worksheet #1 54 of them were well done. The remaining 4 had some incorrect answers and written answers were unsatisfactory. 3. Although the average percent on the first worksheet was over 70% (87%) the average percent on the second worksheet was 62%. The 2nd worksheet was longer and required students to find examples in their real lives. (12/30/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** For #2 I would ask students who felt challenged with written answers to seek help in the Language Arts tutorial center. I would also ask students to check each others work since everyone's worksheet required a unique product. Perhaps I would give extra credit if students checked each others work and each of them earned 90% or better.	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		For #3 I would ask students to work in pairs. I will also give a little more guidance on how to easily finish some of the work.	
	Underlying Course - 3 out of 6 quiz completely incorporated analysis, interp. and communication while on each exam there were a set of questions that required at least one of the following: analysis, interpretation or communication presented from one of the 4 perspectives. **Target for Success:** The average on the 3 quizzes should be at least 80%. The average on the set of questions on each exam should be at least 70%. **Comments/Notes:** It is and will be very difficult to keep track of the set of questions even though they are on certain pages of the exams. I will need to figure out another way.		
	Exam - Course Test/Quiz - varies questions on test 1,2 and 3 **Target for Success:** 70% of the class learn the material	**Program Review Reporting Year:** 2014-2015 **Target :** Target Met Between 60% - 80% students did correctly on related questions (03/21/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students come to class on the regular basis, they do much better. motivate students to come and participate.	
	Exam - Course Test/Quiz - quizzes, exams and final exams	**Program Review Reporting Year:** 2015-2016 **Target :** Target Met About 72% students did related questions correctly (12/17/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Course work encouraged students to be responsible in their learning. Exams tested what they learned. It worked well for my 2 classes.	**Enhancement:** Course assignment encouraged students to take in charge in learning. Exams measured well what they learned. There were students registered for the classes, but hardly bothered to come to class and to do homework, which lowered the class average. (12/17/2015)
	Exam - Course Test/Quiz - On the	**Program Review Reporting Year:** 2017-2018	**Enhancement:** In the future, I

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	final exam, I asked the following question: Find the domain of h(x) = sqrt(x + 4) and compute h(5) and h(12). Sketch the graph of h(x) and plot the points h(5) and h(12) in your sketch. **Target for Success:** At least 60% of class answering this problem correctly.	**Target :** Target Met 75% of the class answered this problem correctly. (08/30/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The majority of the students did a good job of answering this problem correctly. Typically students have a difficult time correctly identifying the domain and understanding the connection between the domain and the graph of the radical function.	might actually ask the students to compute the function for two to three points of their choosing that are in the domain of the function and then graph them. This will help the students draw a more accurate graph, and it could hopefully help students who do not know/remember what the graph of this radical function will look like by deciding to plot more than just three points to discover the shape of the graph. (08/30/2018)
	Exam - Course Test/Quiz - On the final exam, students are asked questions about various types of functions - they are required to graph the functions as well as answer questions about the functions (such as determining if the function is one-to-one, and if so, to find the inverse function). They also were asked to work with composition of functions. **Target for Success:** 70% of the students would score at least 7/10 points on this problem.	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met Of the 24 students who took the final, 20 were able to earn at least 7/10 points on this problem (they were able to graph the function, explain whether or not it is one-to-one, and then graph the inverse). (06/18/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** It seems that students were more comfortable with these problems on the final because over 80% of the students were successful on this problem.	**Enhancement:** I would have liked for all students to have access to a graphing calculator so that they could check their graphs. While most of the students were able to earn at least 7 of the 10 points on this problem, many of them didn't earn a perfect score because they did not graph the function correctly. (06/18/2019)

MATH 12:Introductory Calculus for Business and Social Science

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MATH12_SLO_1 - Use correct notation and mathematical precision in the evaluation and interpretation of derivatives and integrals. **SLO Status:** Active **Planned Assessment Quarters:** 2012-13 2-Fall	**Exam - Course Test/Quiz -** An exam where students show their work to arrive at the answer to the problem; as opposed to a multiple choice/true-false/fill-in-the-blank set of questions. This first exam covered the basics of differential calculus: limits, basic derivatives, and various rules of differentiation. **Target for Success:** The overall goal for the course is a minimum grade of C (68 %); thus for any one exam that, too, would be the goal. Items to be emphasized: mathematical presentation and format; correct use of symbols; correct applications of the derivative rules. Several students on this exam reached their highest test score for the quarter; the class test average was also one of the highest of all tests during the entire quarter. **Comments/Notes:** Though the overall class average met the goal, there were about a third of the students who were well above the average (at least 10 points = B or better) as there were students who were within that many points of the average, and almost an equal number who were that many points below (D, F) the average.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met 50 % of the class met the target of a minimum score of C; only 3 students (just about 20 %) were more than 10 points below target. (02/03/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** This exam depended more on previous algebra skills as well as newly learned calculus concepts, as compared to the exam used in evaluation SLO 2. Thus students had a bit more confidence and knowledge of the mechanics needed in performing the derivative operation. **Program Review Reporting Year:** 2012-2013 **Target :** Target Met Almost 50 % of students who took the exam were at or above the C level (2 students were within 3 points of that mark, a gap easy to bridge). (02/03/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Analysis was based on test scores.	
	Exam - Course Test/Quiz - I used the final test to assess this particular SLO. The final questions were written to check the mathematical	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met 16 out of 23 student performed at the level of 70% or higher. The work of the students who passed showed they	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	precision in the evaluation and interpretation of derivatives and integrals. **Target for Success:** A success is getting a 70% or higher on the final	can use integrals and derivatives accurately with correct notation. (05/11/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The students who did not do well in the final was mostly due to lack of understanding of the word problems and not the notation. But to improve the performance maybe next time I will do more worksheets on notations mixed with word problems.	
	Exam - Standardized - I used final exam to assess the students' ability to use correct notation and mathematical precision in the evaluation and interpretation of deriavatives and integra. **Target for Success:** 70% of the students get 70% or higher on the final.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Not Met Only about half the class (15 out of 25) reached this goal. (11/07/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Although the students did well in finding the solution to the problems, they did make simple notational errors which could've been due to a rushed work on the final.	
MATH12_SLO_2 - Evaluate, solve, interpret and communicate business and social science applications using appropriate differentiation and integration methodologies. **SLO Status:** Active **Planned Assessment Quarters:** 2012-13 2-Fall	**Exam - Course Test/Quiz -** Another 'show-your-work' exam; the content was on the mechanics of anti-differentiation and integration, with half of the exam devoted to mechanics, and the other half to applications. **Target for Success:** The goal (as on all exams) is a minimum score for a grade of C (collectively for the class, as it is for an individual student). Notation, mechanics, and correct use of integral concepts is desired in solving of mechanical and application problems **Comments/Notes:** Here students obviously had difficulty, as for some students (approximately a third) this was their lowest test score. For the rest, they were at or above target. A re-emphasis of the various integration techniques is recommended.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met 50 % of students scored at or above the target. As this material required more understanding of the concepts of integration, students who did not meet the goal scored at least 10 points below the target. (02/03/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** More emphasis apparently needs to be placed not only on the mechanics of integration, but also on their applications. Perhaps more 'minitest's (quizzes) with fewer problems on each -thus using shorter time periods to learn and test- might help with better student understanding and retention of material. **Program Review Reporting Year:** 2012-2013 **Target :** Target Met 50 % of the students met the goal; those that didn't were well below (10 pts or more) the target. (02/03/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The more advanced concept of integration and application was apparently more difficult for students to grasp; perhaps more examples in class, fewer but shorter 'minitests' (quizzes) might be in order.	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	Exam - Course Test/Quiz - An all written final exam focused on application problems in business and social sciences. **Target for Success:** 70% of the students get 70% or higher	**Program Review Reporting Year:** 2013-2014 **Target :** Target Not Met Only about 15 out of 25 students who took the final received a 70% or higher (11/07/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The final in particular may have not been the best way of assessing the students ability to evaluate, solve, interpret and communicate business and social science applications. The students were not able to show what they learned due to the times final.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Met 16 out of 23 student performed at the level of 70% or higher. The work of the students who passed showed a very good understanding of the application problems and how to use differentiation and integration methods in solving real life business and social science problems. (04/25/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** By the end of the quarter, 70% of students seem to have built and understanding of the mathematical process in modeling real life business and social science problems with mathematical equations using differentiation and integration. At the same time, there where the 30% who performed below expectation. Most of them had started the problems but not be able to finish it. More practice should be done possibly and worksheets given to help students finish the process for each problem .	

MATH 1A:Calculus

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MATH1A_SLO_1 - Analyze and synthesize the concepts of limits, continuity, and differentiation from a graphical, numerical, analytical and verbal approach, using correct notation and mathematical precision. **SLO Status:** Active	**Exam - Course Test/Quiz -** Questions related to this SLO were selected from Quizzes 2, 3 and 4. Student performance was analyzed for each chosen question: the number of points received and errors made. The percentages of students who were awarded various scores were calculated. **Target for Success:** None set - First cycle	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met Students were given two quizzes on continuity and limits. On limits, over 72% of the students answered the question correctly On continuity, only 40% answered it correctly but were able to answer the question properly mostly due to an error in the quiz. accounting for the error, 79% students answered the question in a logical manner. (12/14/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Vocabulary was a carry over from a previous text and not discussed in current text, ensure that students have appropriate vocabulary/context for the quizzes.	**Enhancement:** update lecture notes to add more robust vocabulary then just the textbook (12/14/2018)
		Program Review Reporting Year: 2012-2013 **Target :** Target Met Assessment Data Summary: Quiz 2 (Limits) Question 1 (simplify using factoring and canceling): 90% scored 4 or higher; Question 2 (simplify using radical conjugates and simplify): 57% scored 4 or higher; Question 3 (limits using the squeeze theorem): 50% scored 4 or higher; Question 4 (One-sided limits): 95% scored 4 or higher; Common errors made: algebraic errors including incorrect canceling and simplifying of expressions; in question #3, many students did not know how to start the problem in order to use the squeeze theorem; Quiz 3 Question 1 (definition of derivative): Out of 7 points, 82.5 scored 6 or higher; most common error: algebraic errors; Question 2(Graphs of derivatives): 89% scored 4 or higher; most common error was not connecting a horizontal tangent with a zero derivative graphically. Quiz 4: (Derivatives) 3 pt questions. Question 1a (power rule): 95% scored 2 or higher; Question 1b (derivs of e^x, sine, cosine) 98% scored 2 or higher; Question 1c (product rule): 95% scored 2 or higher; Question 1d (quotient rule): 98% scored 2 or higher; Question 1e (quotient rule and simplify); 95% scored 2 or higher. Most common errors:	**Enhancement:** In the future, I will give students an assessment and review of the most common algebra skills they will need for calculus at the beginning of the class to prepare them for the algebra skills they will need in the problems for calculus (03/29/2013)

		algebraic errors when asked to simplify; not recognizing a constant term; 2 students did not use the product rule correctly; 3 students used the quotient rule incorrectly (01/11/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** For the most part, students did very well on these assessments. On quiz 2, at least 75% of students answered questions 1 and 4 correctly. Most of the errors made were due to poor algebraic skills rather than lack of knowledge of the calculus concepts. On quiz 3, more than 85% of students scored 4 or higher on both questions. On quiz 4, over 95% or students answered each question at an acceptable level. The only questions for this student learning outcome that did not meet my expectations were those that required algebraic skills.	
	Exam - Course Test/Quiz - Assess the synthesis of the use of a variety of derivative formulas and rules (product rule, quotient rule, chain rule, logarithmic differentiation) to find the derivative formula of various functions, implicitly defined curves and parametrically defined curves on the final exam. **Target for Success:** Student receives at least 70% score, which is at least 19 points out of a 24 point question on the final exam.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Not Met 17 out of 30 students scored at least 70% on this question, with 3 students receiving 90% or above, 8 students receiving 80% - 89.9% and 6 students receiving 70 - 79.9%. 8 students scored below 70% on this question. The most common errors encountered were in: 1) Logarithmic differentiation (63% of the students made a conceptual error), 2) The use of chain rule when multiple applications of it were required in the same problem (37% of the students made this error) , 3) Implicit differentiation (30% of the students made this error), 4) Differentiation of parametrically defined curves (20% of the students made this error), 5) Product rule (13% of the students made this error). There were several algebra errors throughout as well. (02/04/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** While students seemed to be well versed in the basics of taking derivatives using the product, quotient and chain rules for functions, they made mistakes when multiple applications of chain rule, together with product rule were necessary. Also, students had a difficult time with logarithmic differentiation, which is not often needed later in calculus, but is useful in assessing the students' understanding of the chain rule. While a majority of the students (57%) met the	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		target above, I selected 'Target Not Met' since there were some students that did not meet the target.	
	Exam - Course Test/Quiz - Questions related to this SLO were selected from Exam 1 and Exam 2. Exam 1 covered limits and continuity, while Exam 2 covered differentiation. The overall score on each exam was computed, as well as performance on selected questions. In addition, errors on individual questions were analyzed to ascertain the error made. **Target for Success:** Success on an exam was scoring at least 70%. For individual questions, success was scoring at least 80% of the total points for that question.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Exam 1: This exam covered techniques of calculating limits, including the squeeze theorem, graphical analysis of limit behavior, continuity and the Intermediate Value Theorem. 88% of students scored 70% or higher on this exam. Students demonstrated good knowledge of limits for most questions. The questions for which there were a large number of incorrect answers involved graphical recognition of the value of a limit at infinity (26% incorrect), graphical recognition of discontinuity (38% incorrect), graphical identification and calculation of removeable discontinuities (31% incorrect), and calculation of limits involving square roots (29% incorrect. Exam 2: Questions involving the concept and calculation of derivatives were analyzed. Question 1 asked students to answer questions about a function when given the graph of the derivative. 79% of students were correctly able to identify where the graph of the original function had a horizontal asymptote, while only 43% of students were able to correctly identify the interval on which the function was decreasing. 81% of students were correctly able to calculate a derivative using the definition. Students seemed to be able to calculate derivatives using the various techniques. A small number of errors were made due to errors in using the product rule (10%) or logarithmic differentiation (14%) (04/03/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Reflection and Analysis: For the most part, students did very well on these assessments. For limits, students sometimes had difficulty interpreting the values for which a graph was discontinuous, especially those involving removable discontinuities. The one area on derivatives that students struggled with was being able to identify an interval of increase or decrease from the graph of the derivative. This can be very confusing to students, since they tend to identify the interval on which the derivative is increasing or	**Enhancement:** : In the future, I will give students more opportunities to analyze graphs of functions and identify limits, discontinuities and derivatives from the graphs. These exercises were discussed this quarter, but perhaps an additional group assignment would help. (06/28/2013)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		decreasing, rather than making the connection that the graph of the derivative shows what is happening with the slope of the tangent line.	
	Exam - Course Test/Quiz - Questions on exam 1 and quizzes 1 and 2	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met about 90% students did well graphically with the concepts. 75% also did well verbally and analytically. (12/16/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Continue our effort to keep and improve the percent of success.	
	Exam - Course Test/Quiz - Limits: Quiz 2 covered most types of limits. The scores students received on the quiz were recorded and analyzed. Derivatives: Exam 2 covered derivatives. The scores students received on Exam 2 were recorded and analyzed. **Target for Success:** Target for Success: Success was having at least 70% of students score at least 70% on the quiz and on the test.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met Assessment Data Summary: Quiz 2: Limits 70.7% of students scored at least 70% of the points on this quiz. In addition, 41.5% scored at least 90% and 60.9% scored above 80% on the quiz. Exam 2: Derivatives: 73.1% of students scored at least 70% or higher on exam 2. In addition, 53.6% scored at least 80%. (04/06/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Reflection and Analysis: Quiz 2 Limits: Most students did quite well overall on this quiz. There were some problem areas noted. 6 students (15%) incorrectly interpreted a limit of 0/0 as either 1, 0, or infinity. They did not recognize that the result meant that they had to simplify the problem to determine the limit. There were also some students who made algebraic errors in simplifying the problem and thus obtained incorrect limits. A few students also made small errors in the writing out of a squeeze theorem problem. This is a common problem in problems which have a proof structure – students are not used to writing solutions in a logical manner where one step flows from the other. There was one problem were students needed to use the formal definition of limit in order to prove the value of a limit. Most students were able to correctly write the first part of the proof (finding a delta for a given epsilon), but had difficulty with the second part (showing their delta satisfied	**Enhancement:** Enhancement/Action: I will continue to emphasize that the meaning of 0/0 in the context of limits. I will also continue to review algebraic skills. I did a little of this review, but I think I could do more on a daily basis. For the proof problems, I am going to try another approach to the epsilon delta proof, that perhaps students will understand better. Calculating derivatives is a skill that students need to build up. Some students catch on quickly, others need more time. By the end of the quarter, most students had improved in their derivative-taking skills. (04/06/2015)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		the definition). Again, students had difficulty with the proof format of the problem. Exam 2: Derivatives. Students did quite well on this exam. Some students had difficulty with using the chain rule, especially its use in conjunction with the product and quotient rules.	
	Exam - Course Test/Quiz - Limits: Exam 1 covered limits from several points of view. The overall score on exam 1 was recorded and analyzed. Derivatives: Exam 2 covered derivatives from several points of view. The overall score on exam 2 was recorded and analyzed **Target for Success:** Success was having at least 70% of students score at least 70% on exam 1.	**Program Review Reporting Year:** 2014-2015 **Target :** Target Not Met Exam 1: Limits 68.4% of students scored at least 70% of the points on this exam. In addition, 31.6% scored at least 90% and 60.5% scored above 80% on the exam. Exam 2: Derivatives: 63.4% of students scored at least 70% of the points on this exam. 14.6% scored at least 90% and 43.9% scored above 80% on the exam. (06/23/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Reflection and Analysis: Exam 1 Limits: Many students did very well on this exam, but there were more students than usual that did not do well. The major problem is that these students have very weak algebra and pre-calculus skills. Even though we had been through several examples of common limit problems and the algebra involved in simplifying them, some students were not able to apply these skills to similar problems on the exam. Part of the problem is that when I corrected homework, these same students were turning in incorrect solutions to the homework problems. In these cases, they were not even checking their answers to see if they were correct. Some students were still not able to correctly identify the general category that a function belongs to and three students could not correctly determine the domain of a simple rational function. Exam 2: Derivatives: Again, weak algebra skills often hindered students in their ability to correctly compute and simplify derivatives. This was especially true when the students were required to compute a derivative using the definition of derivative.	**Enhancement:** Enhancement/Action: Next time I teach this course, I will try to enhance my review of prerequisite material. I have increased the material that I review at the beginning of the quarter, and I try to review prerequisite material as problems come up that require a certain technique or concept. But in the future, I will try to do this more. I have suggested that students sign up to tutor students in lower classes as a way of reviewing this material themselves, and a few students have done this. (06/23/2016)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		Program Review Reporting Year: 2014-2015 **Target :** Target Met Exam 1: Limits and Continuity: 85.4% of students scored at least 70% of the points on this exam. In addition, 34% scored at least 90% and 68% scored above 80% on the exam. Exam 2: Derivatives: 78% of students scored at least 70% of the points on this exam. In addition, 26.8% scored at least 90% and 46.3% of students scored above 80% on the exam. (03/24/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Exam 1 Limits: In general, students did well on this exam. The majority of the students were able to evaluate limits effectively. The problem that cause students most difficulty was to use the Intermediate Value Theorem to prove the existence of a root on an interval for a rational function. Most students either incorrectly specified the type of function it was, or did not mention the type of function at all. Also, some students incorrectly stated that the domain was all real numbers, rather than finding the value where the functions was undefined and noting that it did not belong to the specified interval. Students also had trouble correctly correctly stating the conclusion, or logically showing all of the verification steps. Exam 2: Derivatives. In general, students did reasonably well on the exam, although there were some problem areas. The first was in computing the derivative of a simple function using the definition of derivative. The problem I gave was the derivative of f(x)=sqrt(x). Although students were able to set up the definition, some students did not know how to simplify the difference quotient. I looked back over the homework assignments they had been given and there was only 1 problem involving square roots, but they had also done similar simplifications in the limit problems of Chapter 2. Also, students had trouble in recognizing the progression of derivatives when using multiple applications of the chain rule. The other common	**Enhancement:** I have found that students are weak on the names of functions and their domains. In the future, I will emphasize this more in the beginning review materials. Also, I will try to make sure students have more practice in simplifying difference quotients involving roots and rational functions. Finally, I will do more problems that have nested composite functions. There is usually an activity that I do with the class that addresses this, but due to time constraints this quarter, I did not do the activity. I will not do that again. (03/24/2015)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		error was not recognizing numbers such as e and pi as constants when computing derivatives.	
		Program Review Reporting Year: 2014-2015 **Target :** Target Not Met Exam 1: Limits 78.6% of students scored at least 70% of the points on this exam. In addition, 22% scored at least 90% and 58.6% scored above 80% on the exam. Exam 2: Derivatives: 63.4% of students scored at least 70% of the points on this exam. 14.6% scored at least 90% and 43.9% scored above 80% on the exam. (12/07/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Exam 1 Limits: Most students did fairly well on the first exam. Some students did not remember some of the techniques that had been discussed in class regarding finding limits. Also, some students did not fully realize that the existence of asymptotes depended on the limit definitions. They would sometimes not recognize an asymptote that met the definition, but perhaps did not agree with a preconceived ideas they had about what asymptotes looked like. The problem that caused the greatest difficulty for some students was the proof of the existence of a root using the Intermediate Value Theorem. Although we had done and example in class and the student had homework on the theorem, I had not asked a question involving the Intermediate Value Theorem on the quiz for that section. As a result, some students were not prepared to do this type of problem. I also found that students sometimes did not use a logical order in writing out the various parts of the proof: verification of conditions and using correct language in the conclusion. I was pleased with the limit proof on the exam. Most students were correctly able to find a suitable delta. Exam 2: Derivatives. Students had more difficulty on this exam than the seconds exam. Some students did not remember some of the techniques for finding derivatives, especially when using combinations of the chain rule with the product or quotient rules. Also there was a question I	**Enhancement:** Next time I teach this course, I will emphasize finding asymptotes more. I will also include a question using the Intermediate Value Theorem on one of the quizzes prior to the exam. Calculating derivatives is a skill that students need to build up. I will continue to give practice on using the chain rule in combination with other rules. The graphing question that students had difficulty with is one that perhaps I will delay until we have examined graphs in more detail. (12/07/2014)

		had asked in which students were looking at the graph of the derivative and had to state where the graph had a horizontal tangent, or where it was increasing. The students had not had any particular problems in homework like this, but had done several problems to graph the derivative by viewing the graph of the function. Many students had difficulty with this question.	
	Exam - Course Test/Quiz - Limits and continuity: The first question on exam 1 tested whether students could find various types of limits by looking at a graph of a function Graph Behavior: Quiz 7 dealt with the behavior of graphs using calculus. For the 1st problem on the quiz, students were given information about the 1st and 2nd derivatives of a function, but were not given the formula for the original function. This forced students to interpret what they were told about the derivatives without benefit of being able to check the graph on their calculator. In question 2 on Quiz 7, the students were asked to calculate the 1st and 2nd derivative and answer questions about critical numbers, intervals of increase/decrease, local extrema, concavity and inflection points. **Target for Success:** Limits: 70% of students will correctly answer all parts of this question. Graph Behavior: 70% of students will correctly score 70% or higher on the quiz.		
	Exam - Course Test/Quiz - Used 3	**Program Review Reporting Year:** 2015-2016	**Enhancement:** Will grade students

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	problems from the final exam that asks about limits of a function that is not continuous and contains infinite limits. **Target for Success:** Class gets 70% or above correct on question	**Target :** Target Met Will grade for correctness 3 problems from final exam pertaining to limits. Problem pertained to graph given of a function that had several features, including discontinuities, infinite limits, limits that didn't exist, etc. Each of the 3 problems chosen tested for a different kind of limit. (03/27/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** This class did very well. Only the 3rd problem seemed to give the students some frustrations. Problem 3 was probably the hardest. What's most apparent is that if a student didn't do well with any of the questions, then they probably didn't do well with all 3. This seems to support the assertion that weak students didn't do well overall, while strong students did well in all categories. **Related Documents:** Workbook1-F15.xlsx	on the same 3 problems in the winter for comparison. (03/27/2016)
		Program Review Reporting Year: 2015-2016 **Target :** Target Met Will grade for correctness 3 problems from final exam pertaining to limits. Problem pertained to graph given of a function that had several features, including discontinuities, infinite limits, limits that didn't exist, etc. Each of the 3 problems chosen tested for a different kind of limit. These are the same 3 problems as given in the fall. Will compare classes. (03/27/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** As in the fall, the students met the target of 70% or above for correctness. And as again in the fall, students who missed any one of the questions had a higher instance of missing all three, meaning students who did unsatisfactory in the understanding of one concept had difficulty in all, whereas students who understood one concept generally understood them all. **Related Documents:** Workbook1-W-16.xlsx	**Enhancement:** Will grade students in the spring on the same 3 questions for comparison. (03/27/2016)
	Exam - Course Test/Quiz - Exam or Quiz **Target for Success:** 70% passing grades of C or better	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met MiniTest 2 83 % passed with at least a C (at least a score of 68 %) , and Minitest 3 , 65 % passed (04/03/2018)	**Enhancement:** The exam (#2 and part of #3) covers a wide variety of problems, some basic, some advanced. It's a little bit difficult to

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		Reflection (CLICK ON ? FOR INSTRUCTIONS): Minitests cover the basics; on the chapter exam -which covers not only the basics but applications- Exam 2 had a 58 % pass rate. **Related Documents:** [1030 Math 1A Winter 2018.xls]()	pinpoint what problems specifically cover this SLO #1. (04/03/2018)
		Program Review Reporting Year: 2015-2016 **Target :** Target Met Quiz 3: 33 out of 38 students got a passing grade Exam 1: 33 out of 45 students got a passing grade Exam 2: 26 out of 40 students got a passing grade (06/22/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Most students struggled on definition of limit including graph and deriving derivative of inverse trig functions, i will spend more time creating vocab card for students on definition as well as group work to derive inverse trig functions in class	
	Exam - Course Test/Quiz - On the final exam, I asked students to graph a piecewise defined function and asked the students to identify from the graph where the function was not continuous and where it was not differentiable. I then asked the students to verify that the function was indeed not continuous and not differentiable at those points by using the definition of continuity at a point, differentiability at a point, and/or results from class. **Target for Success:** My target for success was that 70% of the class would answer the problem entirely correct or almost entirely correct. **Comments/Notes:** This question was out of 10 points, and if students scored a 7/10 or higher, then I counted this as a success.	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met I found that 26 out of 34 students successfully answered this question. This means that around 76% of the class successfully answered this question. (04/09/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I was very pleased with this result because students in the past have a difficult time determining where a function is continuous and/or differentiable based on the graph of the function and then trying to apply the definitions of continuity and differentiability to verify their answers.	**Enhancement:** For future classes, I will write up more examples of these problems to work on for homework or include on more quizzes so students understand the importance of distinguishing between continuity and differentiability as well as applying the definitions correctly. (04/09/2019)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
MATH1A_SLO_2 - Evaluate the behavior of graphs in the context of limits, continuity and differentiability. **SLO Status:** Active	**Exam - Course Test/Quiz -** Questions related to this SLO were selected from Quiz 3 and quiz 7. Student performance was analyzed for each question: the number of points received and errors made. The percentages of students who were awarded various scores were calculated. **Target for Success:** Quiz 3: Scoring 4 or higher on a 5 point question Quiz 7: 1a scoring 2 out of 2 points; 1b scoring 3 out of 4 points; 1c scoring 2 out of 3 points; 1d scoring 3 out of 5 points	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met Quiz 4 has questions on shapes of graphs based on differentiability with 80%+ students answered correctly. Exam 2 had questions related to graph with limits, diff, and continuity, over 70% students passed this exam. (12/14/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** reinforce the structure of graphing using calculus. students tend to jump between domain, limits, diff, and miss points because they forget to add a component.	**Enhancement:** reinforce the structure of graphing using calculus. students tend to jump between domain, limits, diff, and miss points because they forget to add a component. (12/14/2018)
		Program Review Reporting Year: 2012-2013 **Target :** Target Met Quiz 3 Question 2 (Graphing the derivative from the graph of a function) 89% scored 4 or higher. Most common errors were made in correctly interpreting the behavior of the derivative from the behavior of the original function, especially related to increasing/decreasing graphs, and horizontal tangent lines Quiz 7 Question1 (interpreting graphical aspects of a function from information about its derivative): 1a 87% scored 2; errors made included subtle errors such as indicating the endpoints were critical numbers, and failing to recognize what a critical number was; 1b 47% scored 3 or higher; common errors included confusing the 1st and 2nd derivative tests in identifying local extema; 1c 76% scored 2 or higher; many students were able to correctly identify the inflection point, but not able to explain why. 5 students were unable to say what the critical numbers were; 1d 69% scored 3 or higher. This was the most difficult part ? graph the function given only the information about the derivative. The most common error made was thinking that an indefined 1st and 2nd derivative meant that the function itself was undefined. Other errors included not correctly graphing the increasing or decreasing parts of the function, not correctly representing the concavity of the graph, and not interpreting 0 derivatives correctly. (01/11/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students did quite well on the question from quiz 3. But they did have	**Enhancement:** In the future I will given more problems such as the one from quiz 7, in which they do not have the formula for the function to fall back on, but only have information about the derivative. I gave a few in a slightly different format, but I will design a worksheet give them more practice. (03/29/2013)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		trouble with question 7. Most students were able to correctly identify critical numbers, but had difficulty determining whether they were local extrema. A fair number of students also were unable to correctly identify the critical numbers. In part, it was probably due to the fact that they had not had a problem before where the function itself was not given and they only had the information about the derivative.	
	Exam - Course Test/Quiz - Questions related to this SLO were selected from Exam 3. The performance on each selected question was recorded. In addition, errors on individual questions were analyzed to ascertain the error made. In addition, a group laboratory was given asking the students to analyze a family of functions using calculus. **Target for Success:** Quiz 3: Scoring 4 or higher on a 5 point question Success on each part of a question was scoring at least 80% of the points for that part. Success on the laboratory was scoring 70% or more.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Question 4, Exam 3: This question gave students a table with information about the first and second derivative of an unknown continuous function: where it was positive, negative, zero and undefined. The students were asked questions about the original unknown function: what were the critical numbers, whether the critical number was a local maximum, minimum or neither, and where there were inflection points. Students did very well on this question. Only 18% of students made errors related to critical numbers and local extrema. Some students discounted critical numbers for which the derivative was undefined, because they thought that the function would also be undefined (the function was stated to be continuous). In the question about inflection points, 2 students used a similar incorrect reasoning to discount an x-value with an undefined 2nd derivative. Question 5, Exam 3: This question asked students several questions about a function given as a formula. Essentially they were asked to analyze the details of the function in preparation for graphing, although they were not required to actually graph the function. Students did very well on this question. The only part of this problem that students had any difficult with was in part f, where they were asked to determine intervals on which the function was concave up and concave down. 31% of students were not able to correctly construct a sign graph as instructed correctly, mostly because of incorrect determination of concavity on the intervals. Families of Curves Lab: In this lab, students were given a	**Enhancement:** Next time I teach this course, I am going to cover topics in a slightly different order that may help with the confusion around the Second Derivative test. I will also be more careful about bringing the Second Derivative Test as supporting evidence when discussing local extrema. As far as the distinction between a function being undefined and its derivatives being undefined, I will continue to discuss or have students analyze functions that ask students to explore this distinction. (06/28/2013)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		family of functions to analyze using calculus. They were asked to graph several members of the family, note the relative extrema, inflection points, and intervals of increase/decrease and concavity, and then verify their observations using calculus. Students worked in groups of 3 or 4 on this lab. The results were very good. 74% of students scored 90% or above on this lab, and 90% scored above 80%. Only 1 students who was absent on the day it was worked on in class, and thus did the project alone, scored below 70%. (04/03/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The main area of confusion for students in this area seems to be related to the 2nd derivative. Some students confused the Second Derivative Test for local extrema with tests for concavity and inflection points. The other area of confusion was that having an undefined 1st or 2nd derivative does not necessarily mean the function itself is undefined.	
	Exam - Course Test/Quiz - Exam, quiz or final question	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met 20 out of 23 passed this minitest # 3; 87 % pass; for Exam # 3 , 14 out of 20 (70 %) passed (04/03/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The concepts covered by this SLO are a bit more concrete than the ones in SLO # 1. It was easier to relate concept to graph.	**Enhancement:** As the minitest covers the basics, the exam goes beyond basics to applications, and sometimes a problem or two not seen before, but can be solved using the information covered in class. No surprise exam percentage of success is lower than minitest percentage of success, but the problems themselves change in nature and complexity. (04/03/2018)
		Program Review Reporting Year: 2013-2014 **Target :** Target Met 78% students mastered the topics on the exams (12/16/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** work to improve the percentage	
	Exam - Course Test/Quiz - Assessment Method: Limits: The last question on quiz 1	**Program Review Reporting Year:** 2014-2015 **Target :** Target Not Met Limits: Only 50% of the students were able to correctly	**Enhancement:** Limits and continuity: In the future, I will try to give students more opportunity

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	tested whether students could find various types of limits by looking at a graph of a function Graph Behavior: Students were given a quiz asking them to analyze curves using limits, continuity and differentiability. In the first question, students were only given information about the 1st and 2nd derivatives (positive and negative) They were asked questions about intervals of increase/decrease, local extrema, intervals of concavity and points of inflection; and finally they were asked to sketch the function using the information provided. In the second question, students were given the equation of a curve, and were asked to calculate analyze and graph the curve using 1st and 2nd derivatives. **Target for Success:** Target for Success: Limits: 70% of students will correctly answer all parts of this question. Graph Behavior: 70% of students will correctly score 70% or higher on the quiz.	answer at least 70% of the questions correctly. This percent was much lower than in past quarters. Graph Behavior: 63.2% of the students scored 70% or higher on Quiz 7, which had questions related to using calculus to analyze graphs of functions. Many of the students who scored poorly on this exam had difficulty interpreting the graph behavior just from information about the sign of the derivative and 2nd derivative, without having the formula for the original function. However, on Exam 3, which also had a question asking them to use the equations of f'(x) and f"(x) to answer questions about relative extrema, inflection points, intervals of increase and decrease, and concavity, the students did much better. 82% of the students scored at least 70% on this problem, and 45% of the students did not miss any points on the problem at all. (06/23/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Limits and continuity: Most students, although errors were made, did OK on this question. The most common area of confusion was recognizing a removable discontinuity. Also, some students missed one of the horizontal asymptotes shown. There were a few students who seem totally confused about the how limits manifest in the graph of a function. Graph Behavior: The first question on the exam asked students to determine critical numbers, local extrema, and inflection points by using information about the derivative and 2nd derivative of a function. I have given a similar problem on a worksheet this quarter and we discussed the problem in class. Although many students did well on the question, some students were unable to correctly interpret the 1st and 2nd derivative information and what it told us about a graph. Some of them were answering the question as if the information was that of the original function. However, most students did much better on the Exam 3 question regarding graphs, which showed improvement in understanding of what the derivative tells us about a graph.	in class time to look at such problems. Graph Behavior: I did give the students a similar problem and we discussed it after they had worked on it in groups. I think many in the class did better than in the past. I will continue to discuss similar problems. Graph Behavior: I think that students just need to have time to absorb some of the concepts. I was happy that the students, for the most part did better on the exam when presented with a somewhat harder graphing question, and were able to correctly interpret the information given by the derivative and 2nd derivative. In the future, I will continue to give at least two opportunities to students to grapple with this type of problem. (06/23/2016)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		Program Review Reporting Year: 2013-2014 **Target :** Target Met Assessment Data Summary: Limits: Only 5 students (12%) made any errors at all on the quiz question. There were two students who missed all parts of the question. The other students made errors in only one part. Graph Behavior: 70.8% of students scored at least 70% on this quiz. (04/06/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Reflection and Analysis: Limits: The two students who missed all of the graphical limit question were very confused about the connection between limits and the graph of a function. Sometimes a one-to-one approach with the student can clear up such misconceptions. Graph Behavior: Students actually did quite well on the 1st question. Most students were able to correctly identify the correct areas of increase/decrease and the local extrema, and the concavity intervals. Some students incorrectly thought that if a derivative was undefined, then the graph would also be undefined. The second question was more like the homework they had been given. Some students had trouble correctly finding and simplifying the derivatives, particularly the 2nd derivative, and made mistakes because of that. Some students need much more algebra proficiency.	**Enhancement:** Enhancement/Action: Limits: In the future, I will try to give students more opportunity in class time to look at such problems. I can then ask students to see me in my office hour if they need more help. Graph Behavior: In the future, I will do more algebra review with the class to build up their skills. (04/06/2015)
	Exam - Course Test/Quiz - Limits and continuity: The first question on exam 1 tested whether students could find various types of limits by looking at a graph of a function Graph Behavior: Question 7 on Quiz 7 and Question 4 on Exam 3 dealt with the behavior of graphs using calculus. In both cases, students	**Program Review Reporting Year:** 2014-2015 **Target :** Target Met Limits: Students did very well on this question. Only 4 students did not get all parts correct. Graph Behavior: 78% of the students scored 70% or higher on Quiz 7. (03/24/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Limits and	**Enhancement:** Limits and continuity: In the future, I will try to give students more opportunity in class time to look at such problems. I can then ask students to see me in my office hour if they need more help. Graph Behavior: Students find these types of questions a

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	were given information about the 1st and 2nd derivatives of a function, but were not given the formula for the function f(x). This forced students to interpret what they were told about the derivatives without benefit of being able to check the graph on their calculator. **Target for Success:** Limits: 70% of students will correctly answer all parts of this question. Graph Behavior: 70% of students will correctly score 70% or higher on questions selected from the quiz and exam.	continuity: The students who missed all of the graphical limit question were very confused about the connection between limits and the graph of a function. Sometimes a one-to-one approach with the student can clear up such misconceptions. Graph Behavior: Students did quite well on these as a whole. The main point of confusion seems to be when the derivative or 2nd derivative is undefined. Some students felt that that meant that the function itself was also undefined. Some students failed to list the number as a critical point or a possible point of inflection. This, of course, gave incorrect results when they did the sign graph. For the question where they were given the equation of the function, some students had difficulty simplifying an expression that had negative fractional exponents.	challenge, but it does force them to rely solely on the information given by the derivatives. In the future, I will give more practice with this type of problem. I will continue to review algebraic skills with my students. (03/24/2016)
		Program Review Reporting Year: 2014-2015 **Target :** Target Met Assessment Data Summary: Limits: Only 3 students (5%) were not able to correctly answer the questions about limit values and existence from the graph provided Graph Behavior: 70% of the students correctly answered the question on Quiz 7, while 78.9% of the students correctly answered scored at least 70% of the points on question 4 of the exam. (12/07/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Limits and continuity: The three students who missed all of the graphical limit question were very confused about the connection between limits and the graph of a function. Sometimes a one-to-one approach with the student can clear up such misconceptions. Graph Behavior: Students did quite well on these as a whole. The main point of confusion seems to be when the derivative or 2nd derivative is undefined. Some students	**Enhancement:** Limits and continuity: In the future, I will try to give students more opportunity in class time to look at such problems. I can then ask students to see me in my office hour if they need more help. Graph Behavior: Students find these types of questions a challenge, but it does force them to rely solely on the information given by the derivatives. In the future, I will give more practice with this type of problem. (03/29/2014)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		felt that that meant that the function itself was also undefined. Some students failed to list the number as a critical point or a possible point of inflection. This, of course, gave incorrect results when they did the sign graph.	
	Exam - Course Test/Quiz - Limits: Exam 1 covered limits from several points of view. The overall score on exam 1 was recorded and analyzed. Derivatives: Exam 2 covered derivatives from several points of view. The overall score on exam 2 was recorded and analyzed **Target for Success:** 70% of students will score 70% or higher on Exam 1 and Exam 2		
	Exam - Course Test/Quiz - Used a problem from the final exam that asks about an infinite limit. **Target for Success:** Hopefully, 70% or above of the students in the class get this question correct.		
	Exam - Course Test/Quiz - Used problem from the final exam that asks about an infinite limit of a function. (Active) **Target for Success:** Hopefully, 70% of the class or above get the problem correct.		
	Exam - Course Test/Quiz - Final exam questions used a graph and asked students to identify where it was (dis)continuous, derivative behavior, and limit **Target for Success:** 70% of students got questions correct	**Program Review Reporting Year:** 2015-2016 **Target :** Target Met Three multiple choice questions looking at a graph and determining limit, continuity, and derivative. out of 108 question answers, students answered 88 correctly, or 81% success rate (06/22/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Target met, will focus on more variety and test further elements in future.	
	Exam - Course Test/Quiz - On the		

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	final exam, I asked students to sketch the graph of f(x) = x^4-2x^2 using the first and second derivatives to find critical points, intervals where the function was increasing and decreasing as well as the concavity of the function. **Target for Success:** My target for success is 70% of the students successfully answering this question. **Comments/Notes:** This question was out of 10 points, and if the students received a 7/10 or higher on this question, then I considered it a success.	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met 33 out of 34 students answered this question correctly. This means that roughly 97% of the class answered this question correctly. (04/09/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I was very happy to see so many students answer this question successfully and was somewhat surprised with the surprisingly large number of students who successfully answered this question.	**Enhancement:** I was happy with the results, but feel that I need to put another problem that is a bit more challenging to the students next time or a follow up question that will push the students' understanding of how to apply calculus to graph functions. (04/09/2019)
MATH1A_SLO_3 - Recognize, diagnose, and decide on the appropriate method for solving applied real world problems in optimization, related rates and numerical approximation. **SLO Status:** Active	**Exam - Course Test/Quiz -** Questions related to this SLO were selected from Quiz 5 and the final exam. Student performance was analyzed question #3 on Quiz 5 and question #12 on the final exam: the number of points received and errors made. The percentages of students who were awarded various scores were calculated. **Target for Success:** Success is scoring 10 points or higher out of 12 on question 3 and 4 points or higher out of 5 pts on question #12.	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met Exam 2 had questions on related rates, linear approximation, and optimization. over 70% of students passed this exam. Quiz 5 had a questions on netowns method and 72% (avg across three questions) of students answered these correctly. (12/14/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** target was met but the in the future, it would be good to break down each part of this slo into distinct assignments: Lab, Quiz, Exam.	**Enhancement:** target was met but the in the future, it would be good to break down each part of this slo into distinct assignments: Lab, Quiz, Exam. In the future, have a lab purely around linear approximation, related rates, and optimization. (12/14/2018)
		Program Review Reporting Year: 2012-2013 **Target :** Target Met Quiz 5 #3 (Related Rates): 75% scored 10 or higher; common errors made included not being able to write the relationship between the variables and failing to recognize the constant value in the problem. Other errors made included failing to indicate given information as requested, and substituting in the rates and values at an inappropriate time in the solution Final Exam #12 (Optimization): 49% scored 4 or higher. Another 11% made errors in the set up of the problem, but then were able to correctly find the solution of that	**Enhancement:** In the future, when I teach these types of problems, on the first day of presentation, I will have them only draw the diagram, list the givens and write the equation indicating the relationship between the variables. I will not show them how to solve the problem until the second day. I think that this way, the students will not be so overwhelmed by the entire

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		problem. Common errors made were to fail to check that the solution was an absolute maximum and failing to correctly compute the derivative. 3 students were unable to set up the problem at all. (01/11/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Most students did quite well on this problem. However, there were a good number of students who did not have the procedure down sufficiently well. I think that students would benefit from practicing small parts of the process in isolation, before putting them together in the entire procedure. Many students have difficulty with application problems. Some students were thrown off by its similarity to a slightly different problem given on Exam 3, and solved it as if it were the other problem. Although the students were given several homework problems in this category and several examples were discussed in class, I think students need more practice setting up application	process. I also will allow for time in class for students to do at least part of the process in groups. (03/29/2013)
	Exam - Course Test/Quiz - Questions related to this SLO were selected from Exam 2 (Related Rates) and Exam 3 (Optimization). Student performance on each question was recorded. The percentages of students who were awarded various scores were calculated. **Target for Success:** Success is scoring 80% or more of the total points allotted for the question.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Exam 2 #7 (Related Rates): 69% of students scored 70% or higher on this question. The most common error made (10 students) was failing to recognize a constant in the problem. 18 students had difficulty listing correctly the given and/or desired rates of the problem. 9 students did not know how to solve the problem. Exam 3 #6 (Optimization): 82% scored 70% or higher. The most common error made (16 students) was not fully justifying that the local maximum found was an absolute maximum. Also, some students did not correctly give the answer requested in the problem (the dimensions of each pen as opposed to the dimension of the whole area). But these were actually relatively minor errors. There were only 7 students who did not know the basic process for solving an optimization problem, missing more than half of the points allotted for the problem (04/03/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I felt that this quarter, students had a much better handle on these application problems. This quarter I broke the topic of	**Enhancement:** : I will continue to present these topics with the changes made this quarter. I think the group work was especially beneficial, so I hope to do more of that next time I teach these topics. (06/28/2013)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		related rates into 3 days: the first I discussed how to set up the problems and list the information given. Students then practiced in group. The second day I showed how to solve the problem. The third day the students worked in groups on a problem. Students seemed much more comfortable than last quarter. Their ability to set up problems also carried over for the optimization problem.	
	Exam - Course Test/Quiz - Exam 3 and final exam	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met 18 out of 22 passed this SLO concept - 82 % on minitest 5 ; only 12 out of 23 (52 %) passed the corresponding exam 4. (a 67-68 % considered passing) (04/03/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The minitest covers problems in the first half of the chapter; the exam covers mostly problems in the second half of the chapter. The nature of the problems changes rather drastically from beginning to end of chapter.	**Enhancement:** As problems change from a 'mechanical' technique to more of an 'analytical/synthesis' technique, students seem to have a bit more difficulty with setting up and solving the various word/application/story problems that they encountered. (04/03/2018) **Follow-Up:** The final exam, which is comprehensive and covers all the major topics in both mechanical and application form had an 18 out of 23 (78 %) pass rate. (04/03/2018)
		Program Review Reporting Year: 2013-2014 **Target :** Target Met 65% students are able to do related question correctly on the exams. (12/16/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** More students seem to have trouble to do application problems. More classroom discussions and more homework practice would be helpful.	
	Exam - Course Test/Quiz - Assessment Method: Student scores were recorded from Exam 3 which covered applications of the derivative.	**Program Review Reporting Year:** 2014-2015 **Target :** Target Met 70.7 % of students scored at least 70% on the exam. (06/23/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Although some students did very well on the exam, as a whole, I was	**Enhancement:** I will continue to emphasize the points on which students had difficulty. In particular, I think students need more practice on application problems of several types. I will

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	Target for Success: Target for Success: 70% of students will score 70% or higher on this exam.	disappointed in the results of the exam. Many students had difficulty with the related rates question, which was a simple problem similar to an example I had done in class, and similar to a homework problem. A few students did not know how to do a related rates problem by taking the derivative with respect to time, and other students did not recognize the constant in the problem, or confused other give values as constants. In the optimization problem, some students had difficulty writing the expression for cost, which was the quantity to be minimized. Some students instead wrote the equation for the surface area – a related quantity – and then tried to introduce the cost at a later time. A few students also did not correctly justify that the answer they found was the absolute minimum cost. On the graphing problems, a few students are still confused that a derivate may be undefined and the function f(x) be continuous for all numbers.	try to expand my homework sets with other problems to give the students more practice. (06/23/2016)
		Program Review Reporting Year: 2014-2015 **Target :** Target Met 70.7 % of students scored at least 70% on the exam. (03/24/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Although some students did very well on the exam, as a whole, I was disappointed in the results of the exam. Many students had difficulty with the related rates question, which was a simple problem similar to an example I had done in class, and similar to a homework problem. A few students did not know how to do a related rates problem by taking the derivative with respect to time, and other students did not recognize the constant in the problem, or confused other give values as constants. In the optimization problem, some students had difficulty writing the expression for cost, which was the quantity to be minimized. Some students instead wrote the equation for the surface area – a related quantity – and then tried to introduce the cost at a later time. A few students also did not correctly justify that the answer they found was the absolute minimum cost. On the graphing problems, a few students are still confused that a derivate may be undefined and the function f(x) be	**Enhancement:** I will continue to emphasize the points on which students had difficulty. In particular, I think students need more practice on application problems of several types. I will try to expand my homework sets with other problems to give the students more practice. (03/24/2016)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		continuous for all numbers.	
		Program Review Reporting Year: 2014-2015 **Target :** Target Met Assessment Data Summary: 82.5 % of students scored at least 70% on the exam. In fact, 67.5 % scored at least 80% on the exam. (12/07/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students did actually quite well on the exam. Regarding the related rates problem, most students did quite well. The most common mistake made was failing to record the rate of a decreasing quantity as negative. This resulted in an incorrect solution. In the optimization problem, students did very well overall. A few students had difficulty writing the expression for cost, which was the quantity to be maximized. Some students instead wrote the equation for the surface area – a related quantity – and then tried to introduce the cost at a late time. A few students also did not correctly justify that the answer they found was the absolute minimum cost. On the graphing problems, a few students are still confused that a derivative may be undefined and the function f(x) be continuous for all numbers.	**Enhancement:** I will continue to emphasize the points on which students had difficulty. In particular, next exam I will make sure I state in the directions for the problem, the main things I need to see in order to receive full credit. I did this with the related rates problem, but failed to do it for the maximization problem. (03/29/2014)
		Program Review Reporting Year: 2013-2014 **Target :** Target Met Assessment Data Summary: 78 % of students scored at least 70% on the exam. In fact, 73.1 % scored at least 80% on the exam. (04/06/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Reflection and Analysis: Students did actually quite well on the exam. Regarding the related rates problem, although most students did well, some students had difficulty identifying the rates that were given, and especially the rate that is being solved for. A few students did not correctly follow the procedure to solve for the desired rate. In the optimization problem, students did very well overall. Minor points were taken off for not fully justifying the fact that the local minimum or maximum found was actually the absolute minimum or maximum.	**Enhancement:** Enhancement/Action I will continue to emphasize the procedures for these types of problems, which students find difficult. This quarter, I broke the process down to more manageable parts and it seemed to help many students. (04/06/2015)

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
	Exam - Course Test/Quiz - Exam 3 and Quiz 5: asked students to solve related rates, optimization and numerical approximation questions **Target for Success:** 70% of students go the answers correct	**Program Review Reporting Year:** 2015-2016 **Target :** Target Not Met Quiz 5: 16 out of 33 students passed Exam 3: 27 out of 36 students passed Exam 3 had question on related rates, Quiz 5 had question on optimization and numerical approximation. (06/22/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** With current book format, some of the last topics covered were optimization and numerical analysis. I spend first week of Math 1A reviewing pre-cal students need to be successful in class but will focus on just 1 class next time so I can spend more time on optimization/numerical analysis.	
	Exam - Course Test/Quiz - On the final exam, I asked the students an optimize the volume of a box that has an open top and has a constrained surface area. **Target for Success:** My goal for success was having 70% of the students answer this question correctly. **Comments/Notes:** This problem was out of 10 points, and if the student received a 7/10 or higher on the quiz, then I felt that the student answered the question correctly.	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met 23 of the 29 students who took the final exam answered this problem correctly. This meant that about 79% of the students successfully answered the question. (04/10/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I was pleased with how the students answered this question. I feel that I might create a slightly harder version of this question for future exams.	**Enhancement:** For future classes, I will try to think of variations of this question to test students' understanding of how to solve similar problems. (04/10/2019)

MATH 1B:Calculus

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MATH1B_SLO_1 - Analyze the definite integral from a graphical, numerical, analytical, and verbal approach, using correct notation and mathematical precision. **SLO Status:** Active	**Directly related to Student Learning Outcome (SLO)**	**Program Review Reporting Year:** 2017-2018 **Target :** Target Not Met 16 out of 25 students passed this first minitest, 64 %. (01/10/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Towards the middle/end of the term I sent an email to those full-time instructors teaching Math 1B; only one responded, who decried the weak preparation of the 1B students in that instructor's class. I think my exams may be harder than most other instructors' exams.	**Enhancement:** The class is close to meeting the objectives. (01/10/2018)
	Exam - Course Test/Quiz - Exams, quizzes and homework **Target for Success:** 75% students will be able to solve integral problems graphically , numerically, analytically and verbally.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met about 80% students showed their abilities in the four areas on their homework assignments, about 70% also did well on the quizzes and exams. (05/03/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** assign more homework in these areas to reinforce their understanding.	**Enhancement:** continue the work to keep the success. (06/08/2013)
	Exam - Course Test/Quiz - exams and quizzes **Target for Success:** 70% success	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met about 70% students of the class are able to demonstrate their understanding of the definite integral in these aspects. (07/31/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** results are as expected. We will continue our effort.	
	Exam - Course Test/Quiz - Students were given a midterm where they had to recognize the definite integral, analytically evaluate the definite integral from its definition, numerically approximate the definite integral and determine the level of error, and understand the definite integrals relationship with area. **Target for Success:** The exam was scored out of 60 points. Due to the complexity of the questions a score of 36 or above is considered passing.	**Program Review Reporting Year:** 2016-2017 **Target :** Target Not Met Out of the 27 students who finished this course, 20 of them passed the midterm. This gave a success rate of 74%. The average score was a 42.2. (12/16/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students continue to struggle with the difference between what the definite integral is and what they want it to be. This disconnect is poorly served by the vast quantity of resources that students can find to support them on the internet. The emphasis of many of these resources is	**Enhancement:** To encourage students to work with one another rather than depend on external sources, we can try changing the quizzes to community quizzes. This will hopefully serve to both raise student morale, but also teach them to work together. The hope is that these student interactions will extend beyond the classroom to their individual study habits. At some point we all need to learn that we cannot work in a vacuum.

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
	The target for success in this assessment is to have at least 80% of those students completing the course, passing the exam.	finding computations quickly. As a result students believe that the fundamental theorem of calculus is the meaning or definition of the definite integral. This is problematic as it deprives students of an understanding of how and why integrals can be used to solve real world applications. The internet has also proved to create a stumbling block in trying to ween students off of solutions manuals. There are wealth of sites that can input questions and provide detailed solutions. As a result the previous enhancement of writing original homework problems has not proven to decrease their dependence on solutions being provided to them.	(12/16/2019)
		Program Review Reporting Year: 2015-2016 **Target :** Target Not Met Out of the 36 students who finished this course, only 35 of them took this assessment. Out of those 35, 24 of them passed the midterm. This gave a success rate of 69%. The average score was a 40.5. (10/14/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Some students seemed to only learn one or two specific types of specific problems related to the definition and notation of the definite integral. They would then proceed to use these techniques even if the problem didn't warrant them. This is indicative of students who have a memorization approach to mathematics. Even if they get those one or two problems correct they still don't know why they got them correct. One student confided that her study group did the homework by copying the solutions manual, and then they would sit around memorizing additional homework solutions. Students continue to struggle with inequality arguments and bounding functions and errors.	**Enhancement:** Restructure course to allow for one or two discussions in the first unit. Create a pdf homework assignments in order to wean students off of solution manuals. (10/14/2016)
		Program Review Reporting Year: 2013-2014 **Target :** Target Met	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		Out of the 25 students completing the course, 21 of them passed the midterm. The average score on the midterm was 40.4 out of 60. (12/12/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** A majority of the students have been exposed to integral calculus before taking this course. Unfortunately they tend to believe that the Fundamental Theorem of Calculus (FTC) is the definition of the definite integral. These students were particularly resistant to the Riemann sum definition which is used to develop the applications of integration. By delaying the introduction of the FTC to the second half of the quarter, I had the time to break down some of these notions. Using calculators to evaluate definite integrals during this part of the course also helped connect the students to numerical approximation.	
	Exam - Course Test/Quiz - Used question from the final exam. "Find the indefinite integral of the following function." Problem required student to use a double substitution. Problem was work 10 points. **Target for Success:** Hope is that the average score obtained by the students on this problem is 7 or above (70%). **Comments/Notes:** A nice problem that required students to think a little beyond the typical substitution problem.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met For this question, the average student score was a 7 out of 10 exactly for a 70% average. Although this met our hopes, we thought the average score would be a little higher. (11/06/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Target was met although the hope is that the average score would have been higher. **Related Documents:** SLO Data S14.xls	
	Exam - Course Test/Quiz - Results from Exam 1 on the definition of the definite integral was recorded and analyzed. This exam contained a variety of questions from graphical, numerical and analytic approaches, as well as applications **Target for Success:** 70% of the students will score at least 70% on the exam.	**Program Review Reporting Year:** 2015-2016 **Target :** Target Met 92% of students scored 70% or higher on this exam. In fact, 42% of the students scored above 90%. (03/18/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students did very well on this exam. Some students had difficulty applying the limit definition of the definite integral to evaluate a definite integral. There was also a question that asked students to write the meaning of a definite integral in the context of a problem about the stock values. Overall,	**Enhancement:** Next time, I will give students feedback on the verbal interpretation of the definite integral. (03/18/2016)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		however, students did well.	
	Exam - Course Test/Quiz - The first exam of the quarter was made up completely by problems that required analyzing the definite integral from a graphical, numerical, and verbal approach. Students were asked to rewrite a definite integral as a limit of Riemann sums and compute the value; write a finite Riemann sum for a transcendental function; Give upper and lower estimates of sums using a table of values; Graphically express the midpoint approximation for an area using 6 rectangles; Explain the meaning and relationship of 4 methods of computing Riemann sums **Target for Success:** The goal was to have everyone pass the test with a score of 70% correct or higher.	**Program Review Reporting Year:** 2015-2016 **Target :** Target Not Met mean score was 77.2%, however every student did not pass with a 70% or higher. (03/30/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Although the individual scores did not meet the target, having a mean of 77.2% correct on that exam was acceptable and it was determined that the missed concepts could be revisited and learning supported without having to re-test.	**Enhancement:** This assessment actually gave me good feedback about the level of understanding for these very important topics. In the future, I will make sure to put more emphasis on the areas that the students who struggled the most (the ones with scores below 70%) had the most difficulty with. (03/30/2016)
	Exam - Course Test/Quiz - questions related to definite integral in various approaches were given on quizzes , tests and the final		
	Exam - Course Test/Quiz - Homework , quizzes, tests and final	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met About 70%-80% of the students who had the time to do their homework are able to the related questions on quizzes and tests correctly. (12/21/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students do not have solid algebra foundation struggle in calculus.	**Enhancement:** Encourage students to spend more time to do their homework and understand the problems they did (12/21/2016)
	Exam - Course Test/Quiz - Using either minitest (a quiz of several questions, taking about half the class time) given midway through a chapter, or a chapter exam given at the end of a chapter and taking the		

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	full class period (50 mins). **Target for Success:** 70 %		
MATH1B_SLO_2 - Formulate and use the Fundamental Theorem of Calculus. **SLO Status:** Active **Planned Assessment Quarters:** 2012-13 3-Winter	**Exam - Course Test/Quiz -** Questions from quiz 2 and exam 1 **Target for Success:** 70% - 75% students show understanding of the theorem	**Program Review Reporting Year:** 2016-2017 **Target :** Target Not Met Out of the 27 students completing the course, only 14 of them passed this assessment. This led to a passing rate of only 52%. Their average score was a 12.1. (12/16/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students who take calculus courses also take courses like biology where memorization is a component of their learning. For this reason I know they are capable of memorization, but they seem reluctant to memorize the statements of theorems. As educators, we may be part of the problem. We often emphasize that students need to think critically rather than memorize and although this is true it may lead students to undervalue the importance of things that they do need to memorize. Without memorization they lack the tools they will need when thinking critically. Another possible impediment to this memorization is a confusion between “facts” and “theorems.” Students are conditioned to think of math is something that is always true and this might blind them to the conditional nature of theorems. This is further complicated by the fact that in Math 1B we primarily only give them functions that meet the criteria of the theorems.	**Enhancement:** Emphasize the conditional nature of theorems not only in teaching Math 1B, but in all of the courses along our Precalculus and Calculus sequence so that students become more accustomed to dealing with theorems as tools rather than absolute truths. (12/16/2019)
		Program Review Reporting Year: 2017-2018 **Target :** Target Not Met 24 students took the minitest (long quiz, about half the length of a full exam), 16 passed with a C or better; 20 out of 24 passed with a D or better (01/09/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** With the minitest worth 36 points, several students came close to "passing", thus the target was 'almost' met. Similar results occurred on the chapter exam. (61 % 'passed')	**Enhancement:** It was difficult for me to isolate those questions on the minitest or exam that dealt specifically with the Fund. Theor. of Int. Calc. to determine how many were successful in this specific SLO. Overall, students seem to have a general idea of the concept. (01/09/2018)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		Program Review Reporting Year: 2012-2013 **Target :** Target Met About 70 % to 75 % students answer the related questions correctly. (01/31/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students with strong algebra skills have no trouble to do the problems correctly. Some students struggle with the concept of upper limit function. Encourage students to practice more homework.	**Enhancement:** work with students closely to help more students to understand the theorem (06/08/2013)
	exams, quizzes and homework **Target for Success:** 70 % success	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Most students did very well on the part I of the theorem, a few more students have some trouble with the part II of the theorem. (07/31/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** work more with the students on the part II of the theorem, and assign more homework problems related to part II of the theorem.	
	Exam - Course Test/Quiz - Students were given a quiz where they had to formulate and apply the first and second fundamental theorem of calculus. **Target for Success:** The quiz was scored out of 20 points. Due to the complexity of the questions a score of 12 or above is considered passing. The target for success in this assessment is to have at least 80% of those students completing the course, passing the quiz.	**Program Review Reporting Year:** 2015-2016 **Target :** Target Not Met Out of the 36 students completing the course, only 23 of them received a passing score. This led to a passing rate of only 64%. Their average score was a 13.3. (10/14/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students seem to resist problems that they don't deem to be computational in nature. The idea that the Fundamental Theorems have conditions that need to be met continues to elude them. Despite separating my approaches to definite and indefinite integrals, students have trouble keeping them separate. This quarter, students seemed particularly bothered by the integral valued function. There seemed to be a disconnect about the difference between an integral evaluated from a to b and an integral evaluated from a to x. Students were also hampered by a fundamental inability to differentiate using the product rule. I noticed that far more students completed this course than in the past. Unfortunately, roughly the same number of students passed the class. By and large I am happier to see the students trying until the very end. Now that I have students trying longer (which may be a factor of limited	**Enhancement:** Repetition, Examples and Counterexamples. The students are being exposed to the Fundamental Theorems but do not seem to internalize what they say. Exposure to common mistakes along with their corrections may help them overcome a lack of attention to details. In lecture, I might approach definite integrals with a different variable (dummy) long before introducing integral valued functions to make the transition more natural. It might also be a good idea to present the idea of g(x) verbally as an "area" function in advance of using the integral notation. (10/14/2016)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		retakes) I need to find ways to help them succeed.	
		Program Review Reporting Year: 2013-2014 **Target :** Target Met Out of the 25 students completing the course, 22 of them passed the quiz. The average score on the quiz was 15.1 out of 20. (12/12/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students had the greatest difficulty formulating the Fundamental Theorems. They have a great deal of trouble comprehending the conditional nature of the theorems. They could list all of the components of the theorem, but had difficulty expressing which pieces implied which other pieces. Part of the trouble lies in the fact that the theorems work 98% of the time in the course. I also noticed that students whose first language was not English seemed to be more susceptible to this problem.	
	Exam - Course Test/Quiz - Used problem from the final exam. Problem required student to apply the Fundamental Theorem of Calculus in order to solve for an unknown quantity. **Target for Success:** This problem was worth 10 points and the hope is, the average number of points obtained by the students will be 7 or above (70%). **Comments/Notes:** Again, a nice problem that required students to think more deeply about how the Fundamental Theorem could be used to solve a problem.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met The average score for this problem was a 7.42 out of 10 for an average score of 74.2%. This met our goals. (11/06/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** We were pleased here. This was not an easy problem. The data for this SLO was taken from one class only because in the other class, the problem was given as an extra credit and not required. Thus, many students chose not to try it.	
	Exam - Course Test/Quiz - Quiz 2 contained questions on both the 1st and 2nd Fundamental Theorem of Calculus. The scores on this quiz were recorded and analyzed.	**Program Review Reporting Year:** 2015-2016 **Target :** Target Met 82.3% of students scored at least 70% on this quiz. (03/18/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students did	**Enhancement:** I will continue to give students practice on the Fundamental Theorem of Calculus, especially when one needs to use the chain rule. (03/18/2017)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	Target for Success: 70% of students will score at least 70% on the quiz.	fairly well on this quiz. The question that some students struggled with was using the first Fundamental Theorem of Calculus together with the chain rule. Some students failed to multiply by the derivative of the upper limit. Students generally did well on questions on the 2nd part of the Fundamental Theorem.	
	Exam - Course Test/Quiz - The second quiz of the quarter had several questions regarding the F.T.C. One specific question from the quiz requiring the proper use of the second part of the F.T.C. was used as a measure of student **Target for Success:** Target was 70% of students responding correctly.	**Program Review Reporting Year:** 2015-2016 **Target :** Target Not Met 69.4% of the students correctly responded to the question targeting the second part of the F.T.C. (03/30/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** It was determined that these concepts needed to be revisited and students were given an additional quiz that focused solely on the areas that were missed for the quiz that included the assessment question.	**Enhancement:** In the future, spend a bit more time on part 2 of the FTC. For winter 2016, I decided to give some additional instruction and reassess the students the next week. (03/30/2016)
	Exam - Course Test/Quiz - questions of differentiate the upper limit function (Fundamental theorem of calculus part I) and use definite integral to evaluate (Fundamental theorem of calculus Part II) were on quizzes, tests and the final. Students were required to remember the basic integral formulas. No notes allowed on any tests.		
	Exam - Course Test/Quiz - Quiz 2 focused on FTC parts 1 and 2. **Target for Success:** 75% of students scoring above 17.5/25 on the quiz.	**Program Review Reporting Year:** 2015-2016 **Target :** Target Met 85.7% of students passed the quiz with a score of 18/25 or higher. (07/12/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students displayed a basic understanding of the FTC.	
	Exam - Course Test/Quiz - Homework, quizzes, test 1 and Final Exam	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met About 70% people were able to do the related questions and sigma notation correctly. (12/21/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students need to spent more time to study	**Enhancement:** Encourage students to spend more time to do their homework and understand the problems they did. (12/21/2016)
MATH1B_SLO_3 - Apply the definite	**Exam - Course Test/Quiz -** Used a	**Program Review Reporting Year:** 2012-2013	**Enhancement:** Next time I teach

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
integral in solving problems in analytical geometry and the sciences. **SLO Status:** Active **Planned Assessment Quarters:** 2012-13 2-Fall **Outcome Creation Date:** 12/12/2012 **Outcome Inactive Date:** 12/19/2012	problem from the final exam pertaining to a set-up and calculation of a definite integral in a science application. Problem is as follows: 7. A swimming pool whose volume is 10,000 gal contains water that is 0.01% chlorine. Starting at , city water containing 0.001% chlorine is pumped into the pool at a rate of 5 gal/min. The pool water flows out at the same rate. What is the percentage of chlorine in the pool after 1 h? When will the pool water be 0.002% chlorine? Show your work step by step. You don't need to simplify your answer.(20 points) **Target for Success:** Target was that we hoped that the average percentage of the problem gotten correct per student was 70%, which generally represent a passing grade. **Comments/Notes:** This is an integrated problem requiring mathematical skills and critical thinking.	**Target :** Target Not Met Took all scores of individual students for this particular problem (total possible was 20 points) and calculated the average score per student. The average was 11 points with a standard deviation of 6.26. A 70% average would have been 14 points, so we did not exactly meet our goal. (02/08/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I thought the students would have done better on this problem. The problem given integrates both differential equations and integration. These topics were covered late in the quarter. Hence, the students maybe didn't have enough time to absorb/practice the material. In the future, I plan to possibly have extra work sheets that will help students understand the material quicker. **Related Documents:** Book1.xls A swimming pool whose volume is 10.doc	Math 1B, I plan to give again a similar question on the final exam. Only next time, I hope to have extra worksheets to help students study. (02/08/2013)
	Exam - Course Test/Quiz - Quiz 3, 4 and exam 2 **Target for Success:** 70% students will do the related questions correctly	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met About 80% students did problems correctly on quizzes. About 72% students did correctly on exam 2. (06/10/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students finished homework before quizzes could do the problems correctly.	
	Exam - Course Test/Quiz - Exam 3 and final exam **Target for Success:** 70% success.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met About 77% students can apply the definite integral in solving problems. Students do better in geometry problems. (07/31/2013)	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		Reflection (CLICK ON ? FOR INSTRUCTIONS): continue our effort in the area of application.	
	Exam - Course Test/Quiz - The first five questions on the students' final covered applications to area, volume, arc length, work, and probability. The aggregate score on these 5 questions was used to assess this SLO. **Target for Success:** Each question was scored out of 10 points so the assessment was scored out of 50 points. Due to the complexity of the questions a score of 30 or above is considered passing. The target for success in this assessment is to have at least 80% of those students completing the course, passing this assessment.	**Program Review Reporting Year:** 2016-2017 **Target :** Target Not Met Out of the 27 students completing the course, only 25 took the final. Fifteen of them passed this assessment (60%). The average score on this assessment was 32.1 out of 50. (12/16/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** There is always a risk when assessing any topic on a final. On one hand, the final is the only comprehensive assessment that the students are given. On the other hand, the final is filled with a lot of additional stress and anxiety that the students might be feeling about their math grade or even their grade in other courses at the end of the quarter. In reflecting on this assessment many questions were raised about what students actually struggled with in these applications. Did they struggle with a particular topic or are the results more reflective of their understanding of applications as a whole? It is interesting to note that students averaged slightly better on the applications than they did on the final as a whole (64% compared to 61%). Did students connect more with applications or did they struggle more with the theoretical concerns or does this represent no statistical difference? A better approach to collecting the data might help us get deeper into these questions.	**Enhancement:** Revise the assessment method to obtain a deeper understanding of where in particular students might be struggling in applying the definite integral to applications. (12/16/2019)
		Program Review Reporting Year: 2015-2016 **Target :** Target Not Met Out of the 34 students completing the course, only 18 of them passed this assessment (53%). The average score on this assessment was 30.5 out of 50. (10/14/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I don't know how to feel about this assessment. A week before finals, I broke my foot and was not around to help students prepare for their final. As such, I don't know how greatly the	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		students' scores were affected by my absence. On the other hand, I don't believe I would have met the target even if I had been around.	
		Program Review Reporting Year: 2013-2014 **Target :** Target Not Met Out of the 25 students completing the course, only 16 of them passed this assessment. The average score on this assessment was 34.2 out of 50. (12/12/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Throughout the course students had a harder time with applications than with theory. (They averaged about 40 and 46 out of 60 on the theoretical exams and only averaged 34 and 38 on the more applied exams.) It seems difficult to find a balance between the number of applications and truly understanding how they work. Students are most comfortable with applications when they come down to a memorized formula. Unfortunately, I feel that this does them the least amount of good. They want to integrate pi f(x) squared without knowing that it comes from the cross-sectional area. They want to find the center of mass without understanding the role of density or even knowing that moments are additive while centers are not.	**Enhancement:** The number of applications needs to be pared down so that they can be expanded upon in lecture. Homework questions for these applications needs to be supplemented as the textbook questions are oriented towards the formulas so that even diligent students are missing the underlying principles within the applications. (09/29/2014) **Follow-Up:** The proposal to reduce the number of required applications did not pass through the department's curriculum process. (10/14/2016)
	Project - Each group must select an object like wineglass, flower vase or any similar object that can hold water. Trace the boundary of the object on a piece of graph paper (use engineering graph paper for better accuracy). The object cannot have straight sides. The final answer must be in reasonable units. Use the above object to determine its a. Volume, b. Surface area, and c. Work done to empty the object completely filled with water. **Target for Success:** Each group obtain the equation of the binding		

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	curve in comparison to any standard curve using transformations; Show clear understanding of the methods of using integrals to find volume, Surface-area and work-done. The project will be scored for 30 points based on the uniqueness, presentation and accuracy. **Related Documents:** MATH1B-SLO-3-Group Project		
	Exam - Course Test/Quiz - Used a final exam question on hydrostatic force. "A semicircle 10 feet in diameter is submerged 2 feet in water. Find the hydrostatic force on the object." **Target for Success:** Problem was worth 15 points. Target is that the average score obtained by the students is 10.5 or above (70%). **Comments/Notes:** Standard hydrostatic problem that requires students to set up an integral and solve the problem using standard techniques of integration.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Not Met The average score for this problem was an 8.26 out of 15 for an average percentage of 55.07%. That did NOT meet our hopes. (11/06/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Well, this is a difficult problem to complete without any mistakes at all. It involves both understanding, modeling, setting up an integral, and evaluating it correctly. So, although our goal was not met, we believe the students made good effort.	
	Exam - Course Test/Quiz - Quiz 3 covered finding areas and volumes using integrals. The results of this quiz were recorded and analyzed. Exam 3 covered several applications of the integral, including work, calculation of centroids, arclength and probability. **Target for Success:** 70% of students will score at least 70% on Quiz 3. 70% of students will score at least 70% on Exam 3.	**Program Review Reporting Year:** 2015-2016 **Target :** Target Met Quiz 3: 87.5% of students scored at least 70% on Quiz 3. Exam 3: 77.5% of students scored at least 70% on Exam 3 (03/18/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students did quite well on the quiz. Some students had difficulty when they needed to partition the y-axis instead of the x-axis. Some forgot to re-express the function in terms of y. Students did generally well on the exam. Many students still had difficulty correctly labeling a diagram and showing the element of volume for the given work problem. Because they were not clear about what they were actually finding, they made mistakes in setting up the integral.	**Enhancement:** In the future, I will be more careful about showing students how to label the diagram and show the element of volume (or similar element, depending on the problem). I will be careful to show how the element of work is gotten from the diagram. (03/18/2017)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	Project - Students completed a peer learning project that required them to compute the area between curves from both the dx and dy perspectives, explain the relationship between a definite integral and a Riemann sum, graph the curves, shade the region and draw appropriate approximating rectangles. Then students were asked to grade the project of two of their peers. **Target for Success:** 1. Every student complete the project, and 2. Mean project grade of 85%.	**Program Review Reporting Year:** 2015-2016 **Target :** Target Met Every student completed the project and returned graded peer projects. The mean project grade was 90.8% (03/30/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** This project was very successful. Students did a very good job on their individual projects and also did a good job of critically analyzing and grading projects of two of their peers.	**Enhancement:** The only change I would make to this project is in the instructions to the students regarding their explanations of the concepts. (03/30/2016)
	Exam - Course Test/Quiz - Various problems on the applications of the definite integral were on quizzes, test 2, 3 and the final. students learned to find volumes of revolution, solve physics application such as work, center of mass and hydrostatic force, and use definite integral to find probability.		
	Exam - Course Test/Quiz - Homework, quizzes, tests and final exams	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met About 70% of the students acquired the basic analytic skills to work with applications and the related problems (12/21/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students who do not have solid algebra foundation struggled in calculus.	**Enhancement:** Encourage students to spend more time to do their homework and understand the problems they did. (12/21/2016)
	Exam - Course Test/Quiz - Exam	**Program Review Reporting Year:** 2017-2018 **Target :** Target Not Met An exam taken by 24 students; 14 students passed with a C or better; 20 students passed with a D or better (01/09/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I emailed other instructors who were teaching Math 1B Fall. '17. Only one responded who decried the poor math preparation of	**Enhancement:** Some students consistently scored low on all minitests and exams. (01/09/2018)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		the students in that instructor's class.	

MATH 1C:Calculus

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MATH1C_SLO_1 - Graphically, analytically, numerically and verbally analyze infinite sequences and series from the perspective of convergence, using correct notation and mathematical precision. **SLO Status:** Active	**Exam - Course Test/Quiz -** Questions from exam 2 **Target for Success:** None set, first cycle	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met About 80% students showed good understanding of the various tests on the basic problems. When the problems get more difficult, at least 50% students can answer correctly. (01/14/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Most students understand the concept of how to test sequence and series. Some students got confused with the result of ratio test and result of the comparison test and their conclusions	**Enhancement:** More sample questions for the review of the material. (01/14/2013)
	Exam - Course Test/Quiz - Students were given a midterm where they had to analyze infinite series and sequences and determine what techniques they could use to determine convergence or divergence. **Target for Success:** The exam was scored out of 60 points. Due to the complexity of the questions a score of 36 or above is considered passing. The target for success in this assessment is to have at least 80% of those students completing the course, passing the exam.	**Program Review Reporting Year:** 2017-2018 **Target :** Target Not Met Out of the 35 students finishing the course, only 20 of them passed the exam (73%). The average score on the exam was a 39.4 (about 66%). (12/16/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students seemed to really struggle with the abstract nature of sequences and series. This is often considered the harder part of the course. It is full of a lot of careful detail work. I typically teach this material in the first half of the course because it ultimately constitutes another technique of integration which is the content of Math 1B. Then we move onto co-ordinates, vectors and 3 dimensional space as this is ultimately related to the content of Math 1C. Although this order makes sense from the global perspective of an instructor we wonder whether or not it is the best fit for the local perspective of a student. Would the students benefit from growing into this harder material? This seems to be borne out by this class who went from 66% to 72% to 77% on their midterms. Since this class feels like it is comprised of two distinct and separate halves it seems reasonable to consider flipping the order in which these halves are presented	**Enhancement:** Restructure the course so that co-ordinates, 3 dimensional space, and vectors are taught prior to teaching sequences and series. (12/16/2019)
		Program Review Reporting Year: 2015-2016 **Target :** Target Not Met Out of the 34 students finishing the course only 20 of them passed the exam. (59%). All 20 of the students who passed	**Enhancement:** Reduce Midterms from 45% of grade to 40% of grade to allow for a 5% discussion grade. Hopefully, by attaching points to

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		the exam, ended up passing the course (20 out of 23) passed this exam. The average score on the exam was a 64%. (10/14/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students seemed to struggle with this topic more than any other topic we covered this quarter. Students continue to enter math 1C deficient in earlier calculus skills. In particular they struggle with limits and derivatives. The discussions seem to help mitigate that for some of the students, but other students are reticent to work with their classmates.	the discussion it will encourage the students to be more receptive to the group work. (10/14/2016)
		Program Review Reporting Year: 2013-2014 **Target :** Target Not Met Out of the 34 students finishing the course only 21 of them passed the exam. (62%). Even among those passing the course, only 18 out of 25 passed this exam. (72%) The average score on the exam was a 68%. (10/21/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** It is strange that although the students this quarter were weaker than in past quarters they seemed more appreciative of the things we were trying to learn. One thing I noticed that was different this quarter was a decrease in participation on discussion days. Discussions are focused group problem solving days. The problems are intended to guide students through many of the difficulties that are encountered with sequences and series. Some students who were also in my Math 1B course the previous quarter suggested that having no points attached to discussion in Math 1C might account for this.	**Enhancement:** Reduce Midterms from 45% of grade to 40% of grade to allow for a 5% discussion grade. (05/01/2015)
		Program Review Reporting Year: 2012-2013 **Target :** Target Met Out of the 26 students completing the course, 21 of them passed the midterm. The average score on the midterm was 44.6 out of 60. (07/26/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Again students seemed more comfortable with this part of the course than any other. Series remain alien to the students when we begin the course, but they seem to make their peace with the large collection of tools they have to develop. Students are happy to finish with sequences and series until they begin working on the rest of the course.	**Enhancement:** The “minitest” for this material (the first half of chapter 11) covered the concepts of SLO 1. Out of 50 points the average was 36. 11 out of 18 students were at or above the average, and 14 out of 18 scored at least 60 % (a minimum suggested criteria as defined in the PLO). (01/02/2014) **Enhancement:** For Math 1C Fall,

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		They seem to gain some comfort in the homogeneity of the types of questions they are asked. (No matter how many different techniques they need to apply, the questions still come down to convergence or divergence.) Although no significant improvement was observed between last quarter and this quarter, the students seemed to appreciate having series placed into a framework that relates to what they associate with calculus. This was achieved by a lab in the first week where they explored the integral of e to the power of x squared.	2013: For the 'minitest' worth 50 points, the average score was 36. 11 out of 18 students scored at or above the average, and 14 out of 18 scored at least 60 % (as suggested in the PLO). This minitest covered the first half of Ch 11 which focuses on the topics of convergence and divergence of sequences and series. (01/02/2014)
		Program Review Reporting Year: 2012-2013 **Target :** Target Met Out of the 25 students completing the course, 20 of them passed the midterm. The average score on the midterm was 44.1 out of 60. (05/01/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** It was surprising to learn that the students were more comfortable with sequences and series than other parts of the course. Students identified the quality of discussion exercises in this chapter as a major reason for success. Despite the math 1A prerequisite, quite a bit of time was needed to review limits, most students had completely forgotten about the exponential indeterminate forms. There was some discussion about the target for success which seems somewhat arbitrarily. In observing the data across all 3 SLOs, it was noted that the highest grade achieved by any student who did not pass any one of the SLO assessments was a C+. However, it was also noticed that there was 1 student who passed the course without passing any of the SLO assessments.	
	Exam - Course Test/Quiz - Both a 'minitest' and an exam were given for this material (the first half of chapter 11), which covered the concepts of SLO 1.		

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	Target for Success: The "minitest" for this material (the first half of chapter 11) covered the concepts of SLO 1. Out of 50 points the average was 36. 11 out of 18 students were at or above the average, and 14 out of of 18 scored at least 60 % (a minimum suggested criteria as defined in the PLO). On the minitest, out of 50 points the average was 36. 11 out of 18 students were at or above the average, and 14 out of 18 scored at least 60 % (a minimum suggested criteria as defined in the PLO). On the exam, out of 99 points the average was 65; out of 13 students who took the exam, 9 scored at least 60 % **Comments/Notes:** This material was conceptually quite difficult for students. Students understood the concepts of convergence and divergence, and use of sigma notation was good; but students had difficulty determining which test to use for convergence or divergence, and fell into the trap of misusing the inverse of a theorem with the theorem itself.		
	Exam - Course Test/Quiz - Their fist exam was focused on graphical, analytic, numerical and verbal analyze infinite sequences and series from the perspective of convergence, using correct notation and mathematical precision. **Target for Success:** A grade of 60%	**Program Review Reporting Year:** 2014-2015 **Target :** Target Not Met Test 2 has been focused on MATH1C_SLO_1. The result of Test 2 are the following: Test 2 >=90---------14,>=80--------16, >=70---------9,>=60---------3,<60----------2 (04/04/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The	**Enhancement:** As the enhancement I propose to create a new handout which specifically will target the strategies for a choice of an appropriate tests of convergence (or divergence) of series (04/04/2015)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	or higher.	MATH1C_SLO_1 is traditionally one of the most difficult SLO among all SLOs of higher level courses. By my opinion results are good taking into account that only 2 students have not met the target.	
	Students were given an exam that assesses their analysis of infinite sequences and series from the perspective of convergence, analytically, numerically, verbally, and graphically **Target for Success:** 60% or higher.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met 18 out of 35 students received a grade of 60 or higher which is about 51%. (01/19/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** After discussing the issue with the students, many expressed that their poor performance was due to inadequate preparation from previous courses. Students expressed they were spending more time reviewing topics from 1A and 1B and were not able to practice the new topic of sequences and series as much. In the future quarter I will be spending the first few days reviews the main topics of the previous quarters.	
	Exam - Course Test/Quiz - test questions related to the SLO on quizzes and tests **Target for Success:** 70%	**Program Review Reporting Year:** 2014-2015 **Target :** Target Met Students were given an exam on different aspects of SLO 1. The exam was out of 23 points and given the difficulty of material, a 65% is considered passing. 75% of students were able to get a 15+ out of 23 (65% on exam) and 60% of class was able to get 16+ out of 23 (70% on exam) (12/01/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The exam is generally most difficult as slo 1 has a high degree of mathematical rigor relative to students background and I believe is was very close to achieving 70% pass rate even without normalizing to difficulty. I would like to open up more time in course to slow down and spend extra times on first two sections which are fundamental to remaining portions of SLO1	

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
		Program Review Reporting Year: 2014-2015 **Target :** Target Met 72% of students correctly analyzed different series for convergence on an in class quiz, receiving 70% or higher (10/31/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students need more mixed practice with series to identify the appropriate test required. More worksheets and group study sessions will be used. Students also need to improve their notation, so more guidance will be given to model appropriate notation and justifications.	
		Program Review Reporting Year: 2014-2015 **Target :** Target Met Most students can do 70% the related questions correctly (07/27/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Continue our effort	
	Exam - Course Test/Quiz - Exam 2	**Program Review Reporting Year:** 2014-2015 **Target :** Target Met Exam 2 covers the SLO_1, and class average is 76% (07/26/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Through classroom discussions and homework practices, students are able to grasp the concepts	**Enhancement:** some students need to find time to strengthen their algebra skills (09/28/2015)
	Exam - Course Test/Quiz - Exam 1 **Target for Success:** 80% of students passing the exam with a grade of 70/100 or higher.	**Program Review Reporting Year:** 2015-2016 **Target :** Target Met 93% of students passed the exam with a grade of 70/100 or higher. (07/12/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I believe the assessment was not challenging enough and does not accurately reflect a deeper understanding of sequences and series.	
	Exam - Course Test/Quiz - Question from the final exam asking them to determine if a given infinite series was convergent or not. Students had to explain what test/theorems they were using to determine the convergence of the series.	**Program Review Reporting Year:** 2018-2019 **Target :** Target Not Met The average score on this question was 9.2/15. (07/06/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I think students had trouble understanding how various justifications for showing a series/sequence	**Enhancement:** Next time I teach this course, I intend to give handouts going into greater detail for the various methods for showing convergence/divergence and how to write them up. (07/06/2019)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	Target for Success: At least 60% of the class answering this question correctly.	converged/diverged should be written up.	
		Program Review Reporting Year: 2018-2019 **Target :** Target Met Of the 33 students who took the final exam, 28 of them answered this question correctly. This means that roughly 85% of the class answered this problem correctly. (02/25/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I was generally happy with the way the students answered this question, especially considering that this was the first question on the final exam.	**Enhancement:** Possibly tell students to read over the entire exam slowly and carefully before answering the various questions. I felt as though the work by the few students who did not do well on this question was rushed. (02/25/2019)
MATH1C_SLO_2 - Apply infinite sequences and series in approximating functions. **SLO Status:** Active	**Exam - Course Test/Quiz -** Students were given quiz where they had to use Taylor polynomials to approximate two different functions and then they had to analyze the error of their approximations. **Target for Success:** The quiz was scored out of 20 points. Due to the complexity of the questions a score of 12 or above is considered passing. The target for success in this assessment is to have at least 80% of those students completing the course, passing the exam.	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met Out of the 35 students who finished the course, 25 received a passing grade (71%) The average score was a 14.3. There continues to be limited correlation between those who did well on this SLO and those who passed the class. When considering only those students who passed the class, the success rate only raises to 73%. (12/16/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students continue to improve in their ability to approximate functions with problems. However, a colleague raised an interesting question: “Is this improvement due to a greater understanding or due to the now communal nature of the quizzes.” It seems that the only ways to address this question is to revise the assessment method or to make this a new baseline for future comparisons. Since the community quizzes were implemented to encourage student interactions and to reduce stress while they are developing the skills which are assessed on the midterms, it seems it might be appropriate to adjust this assessment method to imbedded questions on the associated midterm.	**Enhancement:** Revise the assessment method so that it reflects the students’ separate and individual work. (12/16/2019)
		Program Review Reporting Year: 2018-2019 **Target :** Target Met 26 of 32 students taking the quiz got a passing grade. (07/08/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The problem was on alternating series. I feel I could have done more using the integral test.	**Enhancement:** Spend more time discussing how Riemann sums can be used to create upper and lower bounds for both finite and infinite series. (07/06/2019)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		Program Review Reporting Year: 2015-2016 **Target :** Target Not Met 18 of the 34 students who finished the course received a passing grade. (53%) The average score was a 11.2. There seems to be limited correlation between those who did well on this SLO and those who passed the class. When considering only those students who passed the class, the success rate only raises to 65%. (10/14/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students continue to have problems with the use of polynomials to approximate functions. They seem to be at war with their own sense of Math as a class of absolutes as opposed to approximates. Inequality arguments continue to give them problems. Despite introducing a review of what it means to bound a function, students still couldn't keep straight when they need to take derivatives and when they didn't. The tendency to insist on plugging in endpoints continues.	**Enhancement:** Try to increase the focus on approximation and error bound throughout the material on series, so that students are more familiar with it when we come to Taylor polynomials. (10/14/2016)
		Program Review Reporting Year: 2013-2014 **Target :** Target Not Met 24 of the 32 students who finished the course and took the quiz received a passing grade. (75%) The average score was a 14.4. Of the 8 who did not pass, 7 showed some level of understanding, scoring between 40% and 50%. (10/21/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Trouble persists when working with inequalities. Students seem resistant to the use of facts as opposed to equivalences. They seem to have trouble synthesizing what they know. Calculus students have a strong resistance to arguments that they view as being based on algebra rather than based on calculus. Although the target was not met, I was pleased with the overall level of success and believe it can be improved upon in the future.	**Enhancement:** In order to find an error bound on a Taylor polynomial, students need to bound a derivative of the function. Students have trouble grasping what it means to bound a function. Perhaps if a "review" of bounding functions preceded the discussion of error bounds, students might feel more comfortable bounding derivatives. This would allow time to focus on the difference between bounds, upper and lower bounds, maximums, and maximums of magnitudes. A better understanding of the vocabulary should help the students focus on what they are trying to do. (05/01/2015)
		Program Review Reporting Year: 2012-2013 **Target :** Target Met	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		Out of the 26 students completing the course, only 25 of them were there to take the quiz. Out of this subset of 25 students, 20 passed the quiz. The average score on the quiz was 14.5 out of 20. (It should be noted that one of the students who did not pass arrived to class with only 2 minutes left on the 20 minute quiz. Ignoring that score of 2, the average would raise to 15) (07/26/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Although students hated the lab that was created to help improve their understanding of using Taylor polynomials to approximate functions, it did seem to improve their understanding of the process. Students still struggle with the conditional nature of Taylor's inequality and inequality arguments in general. Although these roadblocks persist, I was pleased to observe an increased awareness of these obstacles. In addition to the lab on error bounds, students were aided by the overall framework that was given to the material (focus on how to integrate functions we know are integrable but we do not know what that integral is.) It also seemed to help that I deviated from the text, presenting Taylor polynomials before the Taylor series.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Not Met Out of the 25 students completing the course, 19 of them passed the quiz. The average score on the midterm was 13.9 out of 20. (05/01/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students had a great deal of trouble working with the conditional statement involved with Taylor's inequality. There was wide-spread belief that to bound the n+1 derivative, students need only plug in the endpoints of the interval. Students are particularly uncomfortable working with inequality arguments despite having seen similar arguments when covering the squeeze theorem and the comparison test. Part of the problem may be attributable to an over reliance on examples where the derivative is either increasing or decreasing.	**Enhancement:** Develop more examples where the bound cannot be found at an endpoint. Create a lab assignment based on polynomial approximation and error bounds to ensure that students get a better feel for the details. Increase emphasis on approximations when dealing with series prior to the introduction of power series. (05/01/2013)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	Exam - Course Test/Quiz - 4 questions on exam 3 related to the SLO **Target for Success:** 70% students will correctly do these questions	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met about 71% students had the correct concepts to do the problems. Some made algebraic errors (01/14/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Assign more homework to have students practice their algebra skills.	
	Exam - Course Test/Quiz - A two-part exam was given covering the second half of ch. 11 (material commensurate with SLO-2). One part was an in-class exam, the other was a takehome set of problems covering power series for various functions and their intervals & radii of convergence. **Target for Success:** As before, a 60 % target was used. For both parts of the exam, 8 out of 15 and 9 out of 15 met the target. **Comments/Notes:** From some of the written work on the exam, it looks as if some students tried to derive everything (as if using the first part of the chapter all over again), rather than taking advantage of derivative or integration of a function to produce a new function. Students did well on particular problems that required computing the amount of error or the number of terms needed to achieve a certain accuracy.		
	Exam - Course Test/Quiz - Quiz 4 was focused on using infinite series to approximate a function. **Target for Success:** 70% of students getting 70% or higher on the quiz (7/10).	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met 19 out of 27 students (about 70%) of the students received a grade of 7 out of 10 or higher. (01/19/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students performed better in this quiz vs the first test. They felt more comfortable with the material and have a better understanding of the series. The quiz was a lot more	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		focused which allowed the students to prepare better for it.	
	Exam - Course Test/Quiz - Quizzes, exam 3 and final **Target for Success:** 60%	**Program Review Reporting Year:** 2014-2015 **Target :** Target Met Over 60% of the class show understanding of the topics on tests (07/27/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Continue our effort to improve	
	Exam - Course Test/Quiz - Question on final exam. **Target for Success:** 70% of students receive a 70% or better on the question.	**Program Review Reporting Year:** 2014-2015 **Target :** Target Not Met 43% of students correctly created the power series representation for a given function, receiving a 70% or better (12/11/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students need more practice with integrating and differentiating known PS representations to obtain additional representations. More practice with creating PS representations is needed.	
		Program Review Reporting Year: 2014-2015 **Target :** Target Met There were two questions on final exam related to slo 2 which 43 students took. Out of 86 total answers, 66 were correct of a 76.7% pass rate. (12/10/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students adequately understood topics around function approximation. I would like to structure a quiz solely around this slo to get a more granular knowledge of student understanding to further refine lecture.	
	Exam - Course Test/Quiz - Homework and test	**Program Review Reporting Year:** 2014-2015 **Target :** Target Met 80% students did well on the topics (07/26/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students completed the related homework assignment also did well on the test.	**Enhancement:** How can we help students to find the time to do their homework? (07/26/2015)
	Exam - Course Test/Quiz - I used my second board quiz as my assessment method. For board quizzes, students need to form groups of 2-4 students, create two questions and two solutions to those questions, and then share those questions and	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met At the time of the second board quiz, there were 42 students enrolled in the course. 34 of those students created at least one question and solution that asked students to apply infinite sequences and series in order to approximate functions. This means that about 81% of the	**Enhancement:** For future board quizzes in Math 1c, I will create a list of a few more involved problems that apply infinite series to approximating functions and make sure that at least a three groups commit to answering the

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	solutions with the rest of the class. For this board quiz, I noticed that at least 10 groups created questions that ask students to find and/or apply power series expansions of common functions to solve a problem. **Target for Success:** At least 70% of the class.	class understood how to answer a question involving applications of infinite series to approximate functions. (02/25/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I was fairly pleased with how many of these questions students came up with on their own and answered correctly. I believe that this translated to students doing better on this material on the second midterm.	questions on that list of problems that I create. (02/25/2019)
MATH1C_SLO_3 - Synthesize and apply vectors, polar coordinate system and parametric representations in solving problems in analytic geometry, including motion in space. **SLO Status:** Active	**Exam - Course Test/Quiz -** Students were given a midterm in which they need to use vector functions, polar equations, and parametric representations to solve problems involving planes, lines, curvature, area, and motion in space. **Target for Success:** The exam was scored out of 54 points. Due to the complexity of the questions a score of 32 or above is considered passing. The target for success in this assessment is to have at least 80% of those students completing the course, passing the exam.	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met Out of the 35 students finishing the course, 28 of them passed (80%). Among those passing the course this raises to 26 out of 29 (90%). The average score on this exam was a 46. (12/16/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Student improvement increased steadily throughout the quarter. This type of growth is always satisfying for an instructor, but it leads to questions about why they do not perform as well at the beginning. One possibility is that they may not be coming from a course of sufficient rigor. Students enter our courses not only from previous De Anza instructors, but other colleges, high schools, and even other countries. As a result students might be learning the rigors of a particular instructor at the same time they are learning the rigors of the course material. Since students will often describe sequences and series as more challenging than vectors and parametric equations, it might be appropriate to switch the order of these tangentially related topics to emphasize the “easier” material at the time that students are also learning their instructor.	**Enhancement:** Restructure the course so that co-ordinates, 3 dimensional space, and vectors are taught prior to teaching sequences and series. (12/16/2019)
		Program Review Reporting Year: 2015-2016 **Target :** Target Not Met Out of the 34 students finishing the course only 21 of them passed the exam. (62%). However, among those passing the course, 19 out of 23 passed this exam. (83%) The average	**Enhancement:** Spend more time interacting with my fellow Calculus instructors, particularly those who fall more on the geometric and physics side of the material since

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		score on this exam was a 70%. (10/14/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Although, I am failing to reach my target within the entire class, I am happy to see that I am meeting the target within those students who are passing the class, particularly for those who move on to Math 1D where an understanding of this material is important. I find it interesting that this class scored highest on this material whereas my previous class scored lowest on this material. I am unsure as to whether this reflects changes I have made to my presentation of the material or whether it reflects a different set of perspectives from the students. Half of the course is dominated by sequences and series (which seems much more abstract to students) and the second half of the course is dominated by geometric and physics considerations. It is not uncommon for a student to lean one direction or another. If these results are a reflection of this difference between students, how can I bridge the gap between them?	my own inclinations lean towards the abstract. (10/14/2016)
		Program Review Reporting Year: 2013-2014 **Target :** Target Not Met : Out of the 34 students finishing the course only 19 of them passed the exam. (56%). Even among those passing the course, only 18 out of 25 passed this exam. (72%) The average score on this exam was a 65%. (10/21/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students have trouble escaping the two-dimensional thinking that has served them so well until now. Even that is not entirely accurate, they have an insistence upon Cartesian thinking. There were two marked separations among students. Those students with a physics background were more comfortable working with vectors, but they wanted to jump to results without reasoning. By contrast, those students without a physics background had so much trouble with vectors that they often couldn’t get to the critical thinking parts of the questions. The other major difference I noticed	**Enhancement:** Reduce Midterms from 45% of grade to 40% of grade to allow for a 5% discussion grade to increase discussion participation. Continue to develop a stronger framework for this material. Seek out applications that are not physics based to prevent students from leaning on knowledge without understanding. (05/01/2015)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		was between those students who attended the discussions and those who did not. Although some students who did not attend did quite well on the exam, they still had trouble justifying their work and others who did not attend were extremely lost on some of the problems. Those who did attend discussion seemed to have a more even level of comprehension across the material and a better understanding of how to communicate their work. I have still not found the coherent framework I hope to find for this half of the course. It has helped to link polar with parametric equations, parametric equations with vector-valued functions, and Kepler's Laws with polar equations.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Not Met The exam was scored out of 60 points. Due to the complexity of the questions a score of 36 or above is considered passing. Out of the 26 students completing the course, 20 of them passed the midterm. The average score on the midterm was 41.0 out of 60. (07/26/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students continue to show the most difficulty in working with the geometric aspects of the course. Several students expressed dislike and discomfort with graphing. Although vectors are covered in Math 43 and again in some physics courses, not all of the students have exposure to those courses. Also, those who have taken physics classes are resistant to showing the work required of them, believing that whatever was adequate for their physics class should be fine in their calculus class. Students were reminded several times before the exam, that I would be looking for different things than their physics instructors and that certain formulas were forbidden so that they could demonstrate an understanding of the relationships of motion from a rate of change perspective. The reworked discussions seemed to improve matters significantly, but there is still a way to go. Despite an emphasis on critical thinking skills throughout the quarter, students still want to memorize that "this problem" is "that type of problem" and it should be done "this particular way". This problem is more pronounced as we work with	**Enhancement:** Perhaps students would be able to cope with the diversity of questions in the geometric parts of the course better if that part of the course were given an all-encompassing framework similar to the one developed for the first half of the course. (02/01/2014)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		vectors due to the diversity of situations that can be described with vectors.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Not Met Out of the 25 students completing the course, 17 of them passed the midterm. The average score on the midterm was 34.6 out of 54. (05/01/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Some were surprised that the students did better with series than they did with vector functions. Others had encountered similar situations in the past. Series are alien to the students but this strangeness may encourage them to study harder. By contrast, students are familiar with vectors from previous math and physics courses, so they may take the material for granted. There seems to be some difficulty in recognizing that a variety of problems are related. The focus on how to do “a particular” problem interferes with getting a grasp of the broader topics.	**Enhancement:** Since students seemed to feel that the discussions for sequences and series were much more helpful than the discussions for vector functions and coordinate systems, the discussions for the more geometric sections need to be improved. (06/28/2013)
	Exam - Course Test/Quiz - Multiple questions on both exam 1 and exam 3	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met About 75% students did dimension 2 vector questions on the exams correctly , about 68% students did both dimension 2 and dimension3 vector questions on these exams correctly. (01/14/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students seem to have more trouble with dimension 3 vectors. Spent more time on the subject.	
	Exam - Course Test/Quiz - 'show-your-work' exams were used for the chapters covering the material and concepts in SLO-3. Average scores for the 18 students were respectively 63, 70, & 79. Overall, 2/3 of the students were at or above the average for any given test. **Target for Success:** A score of 68 % is typically my target for success for any student on any minitest or		

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	exam. (just slightly above 2/3 of the value of the minitest or exam) **Comments/Notes:** For those who had polar coordinates in Trig, or vectors in Physics, clearly this (and the other) material was much easier than the material on series and sequences.		
	Exam - Course Test/Quiz - Second test questions focused on using vectors and polar/parametric representations to solve problems. **Target for Success:** 70% of students getting 70% or higher on their exam.	**Program Review Reporting Year:** 2014-2015 **Target :** Target Met out of 44 students who took exam 2, 32 received a passing grade for a total pass rate of 32/44 = 72.7%. (11/05/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students are adequately undertanding this SLO but I would like to tailor more quizzes around individual pieces of this SLO to get a better understanding of student understanding to better focus lecture.	
		Program Review Reporting Year: 2013-2014 **Target :** Target Not Met 18 out of 26 students, about 69%, received a grade of 70 or higher. (01/19/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students felt the topics relied on materials from Math43, precalsulus, which some had low preparation for and had to review a lot more. I will be devoting more days to these material and provide students with handouts helping the review the material from the precalculus course.	
	Exam - Course Test/Quiz - quizzes, exam 2 **Target for Success:** 70%	**Program Review Reporting Year:** 2014-2015 **Target :** Target Met About 72% students mastered the topics on the tests. (07/27/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Keep up our effort	
	Exam - Course Test/Quiz - Question on final exam **Target for Success:** 70% of students receive a 70% or better on this question.	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met Students averaged 10 out of 12 points on final exam question on vectors. (07/06/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students did well on this question	**Enhancement:** Introduce material on motion earlier, before curvature. (07/08/2019)

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
		Program Review Reporting Year: 2014-2015 **Target :** Target Met 77% of students correctly sketched, differentiated and found curvature of a space curve, obtaining a 70% or higher on this question. (12/11/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students need more practice with curvature. They were fine sketching, differentiating and sketching the derivative vectors, but had trouble with the curvature formula.	
	Exam - Course Test/Quiz - Test 1 and test 3	**Program Review Reporting Year:** 2014-2015 **Target :** Target Met 75% students pass the test (07/26/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** students apply themselves are able to understand the topics well.	**Enhancement:** Vectors and motion in space maybe challenging for some. More time to discuss the topics would be helpful (07/26/2015)
	Exam - Course Test/Quiz - On the final exam, I asked students to sketch the graphs of two curves, a circle and a cardioid, that were given in polar coordinates. I then asked them to find the enclosed area inside of the cardioid and outside of sphere using an integral. **Target for Success:** 70% of the class answering this problem correctly.	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met Of the 33 students who took the final exam, 28 of them answered this question correctly. This means that about 85% of the class got this problem correct. (02/25/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I was glad to see that so many students answered this question correctly, especially since a number of them had trouble with these types of problems on one of the previous midterms in the class.	**Enhancement:** Since so many students did really well on this question, I might put a bit more involved problem that is similar to this one on a future final exam or require the students to convert the equations of the circle and cardioid from rectangular coordinates to polar coordinates as an add extra step to this problem and test their understanding of converting between rectangular and polar coordinates. (02/25/2019)

MATH 1D:Calculus

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MATH1D_SLO_1 - Graphically and analytically synthesize and apply multivariable and vector-valued functions and their derivatives, using correct notation and mathematical precision. **SLO Status:** Active	**Exam - Course Test/Quiz -** Problems 1a, 1b, 2, 5, 7 and 10 on the final exam relate to this SLO. **Target for Success:** My target for success was for at least two thirds of the students taking the final to earn at least 75% of the available points on at least four of the six problems mentioned above.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met At least 75% of the available points on: 6 problems - 12 students 5 problems - 13 students 4 problems - 15 students 3 problems - 6 students 2 problems - 3 students 1 problem - 2 students (05/02/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** With 40 out of 51 students demonstrating proficiency on this SLO, it was successfully met.	
	Exam - Course Test/Quiz - Evaluate the percentage of students passing Exam 1. **Target for Success:** At least 70% of the students passing Exam 1.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met Twenty-eight out of 40 (70%) students passed Exam 1. (01/29/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 28 of the 40 students (70%)passed the Exam 1. 81% of the students were quite competent in explaining both the geometric and the physical interpretation of partial derivatives. In problems relating to three-dimensional surfaces that are analogous to mountain ranges, 62% were able to evaluate directional derivatives, but were unable to analyze the steepness and rates of ascent and descent in particular compass directions. Furthermore, this group was unable to use gradient vectors to find trajectories of heat seeking objects.	**Enhancement:** I will provide more realistic problems from a wider range of fields that require not only the understanding of the concepts, but also the interpretation of results. (02/04/2014)
	Exam - Course Test/Quiz - I will use the First test performance for this SLO as the topics were based on these objectives. **Target for Success:** 70% of students pass the test with a grade of 70 or higher.	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met Out of 42 students 41 of them passed the test (74%). (10/08/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students did very well. Although the time to learn the material was rather short the course met the target.	**Enhancement:** I would like to include more graphical approach in the test in the future. (10/08/2017)
	Exam - Course Test/Quiz - On the final exam, I asked students to compute the partial derivatives with	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met Around 94% of the students answered this question	**Enhancement:** The next time I teach the class, I could ask the students to verify that mixed

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	respect to the variables x and y for f(x,y) = (y + 2e^(3x))ln(x^2 + 4) + tan(x^3 + 5y + 1) **Target for Success:** At least 90% of the students answering this problem correctly.	correctly. (08/28/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Almost the entire class answered this question correctly. This was the very first question on the final exam and was meant to give the students a mental boost and help build their confidence for the exam.	partial derivatives of the commute. (08/28/2018)
MATH1D_SLO_2 - Use double, triple and line integrals in applications, including Green's Theorem, Stokes' Theorem and Divergence Theorem. **SLO Status:** Active	**Exam - Course Test/Quiz -** Problems 3a, 3b, 4a, 4b, 6, 8, 9 and 11 on the final exam addressed this SLO. **Target for Success:** I judge success on this SLO to be for at least two thirds of the students taking the final exam to earn at least 75% of the possible points on at least 5 of the 8 problems listed above.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Earning at least 75% of the possible points on... 8 problems - 6 students 7 problems - 14 students 6 problems - 8 students 5 problems - 7 students 4 problems - 5 students 3 problems - 2 students 2 problems - 6 students 1 problem - 1 student 0 problems - 2 students (05/02/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The target for this SLO was met, but just barely. I will work to improve my teaching of these topics the next time I teach Math 1D.	
	Exam - Course Test/Quiz - Evaluate the percentage of students passing Exam 2 **Target for Success:** At least 70% of the students passing Exam 2.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met 26 of the 36 (72%) students passed Exam 2. (02/20/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** In this course, we extended the basic ideas of differential and integral calculus to functions of two or more variables. Most students had no problem evaluating partial derivatives and multiple integrals. In Exam 2, 84% of the students were able to evaluate double and triple integrals, but only 64% were able to set up triple integrals to find the volume bounded by several surfaces. And only 58% were able to evaluate triple integrals using only geometric interpretation and symmetry.	**Enhancement:** Assign more problems that require both graphing surfaces, and to set up triple integrals to find volume bounded by such surfaces. (02/24/2014)
	Exam - Course Test/Quiz - Our second test covered the objectives in this SLO. **Target for Success:** 70% of students get a passing grade of 70 or higher.	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met out of 42 students 30 of them passed the test (71%). (10/08/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The class did	**Enhancement:** For future courses I will be using more worksheets and put more time between the last day to cover the material and the

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		well but I think with more practice they could have done even better. Maybe the time between covering the material and the test was not long enough.	day of the test. (10/08/2017)
	Exam - Course Test/Quiz - On the final exam, I asked the students the following: Setup, but do not evaluate, the double integral for the surface area of the helicoid r(u,v) = <u cos(v), u sin(v), v> for 0 <= u <= 2 and 0 <= v <= 4 pi. **Target for Success:** I anticipated that at least 70% of the students should answer this question correctly.	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met Exactly 80% of the class answered this exercise correctly. (08/28/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Even though my target was met, there were more students than I expected who made a few errors in setting up the double integral.	**Enhancement:** Next time I teach the class, I need to make sure I spend a little bit more time covering the surface area of surfaces. (08/28/2018)
MATH1D_SLO_3 - Synthesize the key concepts of differential, integral and multivariate calculus. **SLO Status:** Active	**Exam - Course Test/Quiz -** Looking at the overall grade on the final exam. **Target for Success:** I consider success to be for at least two thirds of the class to earn at least 75% on the final exam.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Not Met 32 students scored at least 90 out of 120 on the final exam. 19 students did not. (05/02/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The target was almost met. I will strive to improve its teaching the next time I teach Math 1D.	
	Exam - Course Test/Quiz - Evaluate the percentage of students passing Exam 3. **Target for Success:** At least 75% of the students passing Exam 3	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met Over all 77% of the students passed the Exam 84% correctly evaluated line integrals. 68% used proper theorems in evaluating line integrals. (03/13/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 27 of the 35 (77%) students passed Exam 3. 72% of students were able to determine a particular line integral was independent of path and hence use the short-cut by applying the Fundamental Theorem of line integrals, on the other hand, 85% of the students failed to test for independence and did the problem directly – a significant challenge. This was also true in application of Green's Theorem and Divergence Theorem as some students failed to see that these theorems were not a mere convenience, but a necessity in evaluating more challenging line integrals.	**Enhancement:** I need to do more problems where the students are asked to make correct choices before actually attempting the problem. (03/28/2014)
	Exam - Course Test/Quiz - The third	**Program Review Reporting Year:** 2016-2017	**Enhancement:** I would start

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	exam covered the material concerning this SLO. **Target for Success:** 70% of students get a grade of 70 or higher.	**Target :** Target Not Met 23 out of the 42 students taking this exam passed it (55%) (10/08/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The success was well below expected. Chapter 16 which is tested in this exam is a very difficult chapter for students that covers a lot of material and theory. The result are probably normal for the class but it could be better.	covering the material in this section a little sooner mixing with other topics to make it more natural for students. (10/08/2017)
	Exam - Course Test/Quiz - On the final exam, I asked the students the following: Show that the function f(x,t) = sin(x + 3t) + cos(2x + 6t) is a solution to the wave equation f_tt = 9 f_xx. **Target for Success:** At least 70% of the students answering this problem correctly.	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met Around 91% of the students answered this question correctly. (08/28/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** On the first midterm, I put a partial differential equations problem on the exam and a number of students had a difficult time answering the question correctly. After seeing that almost the entire class answered this problem correctly, I decided to put another PDE problem on the final. I was pleasantly surprised to see the entire class do much better and learn from their mistakes.	**Enhancement:** Next time I teach the class, I will be sure to emphasize the importance of these types of questions and how they incorporate a lot of the different multivariable differentiation rules. (08/28/2018)

MATH 201:Pre-Algebra Refresher

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MATH201_SLO_1 - Place, via test at Placement Office, into a mathematics course above Math 210. **SLO Status:** Active	**Exam - Standardized -** Exit Test **Target for Success:** 50%		

MATH 202:Beginning Algebra Refresher

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MATH202_SLO_1 - Place, via test at Placement Office, into a mathematics course above Math 212. **SLO Status:** Active			

MATH 203:Intermediate Algebra Refresher

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MATH203_SLO_1 - Place, via test at Placement Office, into a mathematics course above Math 114. **SLO Status:** Active			

MATH 210:College Math Preparation Level 1: Pre-Algebra

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MATH210_SLO_2 - Demonstrate and apply the knowledge and skills required to select the correct introductory formulas, procedures, and concepts from algebra and geometry and use them to solve problems. **SLO Status:** Active	**Exam - Standardized -** Question 2 on final exam required students to correctly simplify an algebraic expression by using the order of operations. **Target for Success:** At least 80% of students should answer this question correctly.	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met A total of 29 students took the final exam. Out of those students, 24 answered the first problem correctly (around 83%) and 27 answered the second problem correctly (around 93%). (12/21/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** For the first two questions, I was quite happy that a large percentage of the students answered these correctly. Leading up to the final exam, I did a large number of "flash back" problems involving linear equations and stressed that the students will have to have a solid understanding of how to solve linear equations in order to be successful in Math 212 (beginning algebra). This probably meant that the students understood the importance of studying these types of problems.	**Enhancement:** Next time I teach Math 210, I will try to push the students to do slightly harder and more involved linear equation exercises. The goal is to create a strong algebra foundation for the students. I will also try to incorporate more application problems involving linear equations. This will help the students understand how to setup and solve linear equations in their future mathematics classes. (12/21/2017)
		Program Review Reporting Year: 2017-2018 **Target :** Target Met A total of 17 students took the final exam. Out of those students, 13 answered this problem correctly (about 76%). (12/21/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I was satisfied to see that more than 70% of the class answered this question correctly. When I initially covered percent increase and percent decrease, a number of the students had a difficult time with the topic. As a result, I added more application problems to their in-class group work, and I also did a number of similar questions during the final review sessions at the end of the quarter.	**Enhancement:** Next time I teach the class, I will be sure to add in more application examples at the very beginning of the percent increase and percent decrease section to help students see the utility in learning this topic. (12/21/2017)
		Program Review Reporting Year: 2012-2013 **Target :** Target Not Met 34 out of 50 students answered this question correctly. (01/26/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I used a lot of class time(group activities) to practice order of operations problems with class. Many students improved in this area greatly, while others still had difficulty understanding	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		mathematical notation. I think that giving students more problems to practice would help with mastery.	
	Exam - Course Test/Quiz - Problems 13, 14, 15 and 18 on the final exam, worth a total of 18 points, were relevant to this SLO. **Target for Success:** At least 2/3 of the students in the class should be able to score 13 or more points out of 18 on these three problems.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Not Met 18 out of 41 students scored at least 13 points out of the 18 possible on these four problems. The other 23 students scored 12 or fewer. (11/23/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I will endeavor to improve my teaching of this area the next time I teach Math 210.	
	Exam - Course Test/Quiz - 5 out of 40 questions on the final were related to this SLO. **Target for Success:** At least 2/3 of the students on the final average a 70% for these questions.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met 11 out of the 21 students who took the final met the target. (01/03/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Target not met, but was close. Many students came very close to averaging at least a 70% on the 5 questions.	
	Exam - Course Test/Quiz - I gave the students a quiz that had 8 questions that asked them to find the area of various shapes. **Target for Success:** 60% or more students will get a passing grade.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met 70% of the students received a passing grade on this quiz. (05/05/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I was pleased with the number of students who received a passing grade on this quiz. The method of instruction I used in class worked well to prepare the students for the quiz problems.	
	Exam - Course Test/Quiz - percent of students correctly showing a logical process and reaching a final solution to an application problem. **Target for Success:** 70% of students	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met 74% of students correctly outlined a step by step procedure and found the correct answer. (05/13/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** target was met	
	Exam - Course Test/Quiz - Gave students an exam using various skills related to fraction and ultimately ending with application problem. **Target for Success:** 70%	**Program Review Reporting Year:** 2014-2015 **Target :** Target Met Students took exam 1 where various properties of fractions where used and ended with an application problem where students needed to user correct formula to setup and solve. 24 out of 30 students passed the exam with a score of 15+ out of 21 or a 80% pass rate. (01/26/2015)	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		Reflection (CLICK ON ? FOR INSTRUCTIONS): Students adequately understood this SLO and in future classes will focus more on application problems to understand if there are other portions of this SLO that could be taught better.	
	Exam - Course Test/Quiz - For quiz 5, students were asked to compute the percentage increase tuition which required a 4 step approach. The question was worth 4 points **Target for Success:** 70% of students getting at least 3 out of 4 points on the problem	**Program Review Reporting Year:** 2014-2015 **Target :** Target Met out of 29 students who took the quiz, 30 scored 3 or more points out of 4 on the problem so approximately 75% of students satisfactorily answered this question. (06/26/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** students understood this problem and in future i would like to create an exam/quiz that focus just on these types of questions.	
	Exam - Course Test/Quiz - Looked at problems on final exam that required students to choose the correct formula to solve an application problem. **Target for Success:** At least 70% of student could achieve getting an average of 70% on those problems.		
	Exam - Course Test/Quiz - 3 Problems on Exam 3 used this SLO **Target for Success:** 60% of the students will get at least 70% of these questions correct	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met 21 out of 30 students got these problems correct (11/03/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** the target was met	
	Exam - Course Test/Quiz - For the final exam, I wanted to test how well students understood how to apply the concepts for solving linear equations that had fractions, decimals, and a mixture of the two types of numbers together in a single problem. The following exercises were from my final exam: Solve for x in the following equations 3/4x - 1/2 = -3 and 2.3 + .1(x + 2.9) =		

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	6.9 **Target for Success:** For the first problem, the students should understand how to isolate the variable x and do arithmetic involving fractions. I anticipated 80%-90% of the class would answer this problem correctly. For the second problem, I wanted to see how students could extend what they did in the first exercise by applying the distributive law in order to isolate the x-term and apply their knowledge of arithmetic with decimals. I anticipated that around 70%-80% of the class would answer this correctly. **Exam - Course Test/Quiz -** On the final exam, I wanted to see how well the students could apply their knowledge of percent increase and percent decrease to everyday problems. My exam question is as follows: You go out to dinner at your favorite restaurant, Breakfast, Brunch, and Beyond, and your check is for $17.80. You plan on leaving a 20% tip for your meal. How much money will you leave for the check and tip? **Target for Success:** I anticipated that at around 60%-70% of the class would answer this problem correctly.		
MATH210_SLO_1 - Demonstrate and apply a systematic and logical	**Exam - Standardized -** Question 37 on final exam, which involved finding	**Program Review Reporting Year:** 2012-2013 **Target :** Target Not Met	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
approach to solving arithmetic and geometric problems. **SLO Status:** Active	the missing leg of a right triangle using the Pythagorean Theorem. **Target for Success:** At least 70% of students will answer this question correctly.	22 out of 50 students answer this question correctly. (01/26/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students struggled with using the Pythagorean Theorem, especially with the idea of isolating and solving for a variable by taking the square root of both sides. Students could have benefited from more in-class practice to gain mastery.	
	Exam - Course Test/Quiz - Everything on the final exam relates to this SLO. **Target for Success:** At least 2/3 of the students taking the final exam should score 75% or better on the final exam.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Not Met 9 out of the 21 students who took the final scored at least a 75% on the final. (01/03/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The Target for success was not close to being met. As a class, we spend a great deal of time reviewing for the final. Generally, students do worse on the final than their average midterm score. For this particular class, there was a cluster of high scores (above 85%) with the remainder of students falling below 75%.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Not Met 21 out of 41 students scored at least 75% on the final exam. 20 out of 41 students did not. (11/23/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I will endeavor to do a better job teaching the material next time I teach Math 210.	
	Exam - Course Test/Quiz - For quiz 4, determine the cost of a rental car with per day and per mileage charges using a 5 step systematic approach **Target for Success:** 70% of answers should be correct.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met 72% of answers were correct (05/13/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** need to work with more applicatinons	
	Exam - Course Test/Quiz - Quiz 3 focused on students combining like terms and using the distributive property, both of which students need to follow systematic/logical approach to solving problems. **Target for Success:** 70%	**Program Review Reporting Year:** 2014-2015 **Target :** Target Met 19 out of 24 students received a 7+ out of 10 on this quiz for a 79% pass rate. (02/18/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** expand quiz/exam to cover multiple portions of logical/systematic solving for both arthmetic/geo problems to get better	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		understanding of gaps and re-foucs lecture.	
	Exam - Course Test/Quiz - Exam 1 required students to use systematic/logical approach to solve problems with fractions and ended in a word problem requiring use of fractions to get correct answer. **Target for Success:** 70% of students passing the exam.	**Program Review Reporting Year:** 2014-2015 **Target :** Target Met Out of 36 students who took the exam, 27 received a pass grade or 75% of students passed. (06/26/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I would like to design an exam/quiz that solely focuses on word problems that require students use systematic/logical approach to get a more granular breakdown of student understanding around this SLO	
	Exam - Course Test/Quiz - Look at performance on Exam 3 which covered solving equations and percent application problems. **Target for Success:** The class average on Exam 3 was at least a 70%.		
	Exam - Course Test/Quiz - 2 problems on exam 2 covered this SLO **Target for Success:** 75% of the students will get a 70% or higher on these problems	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met 23 out of 30 students received a 70% or higher on these problems. (11/03/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** the target was met	
	Exam - Course Test/Quiz - On my final exam, I asked students to solve a linear equation that had integer coefficients. The problem was the following: Solve for x in the equation 2 - 3(x+5) = 7x + 10 **Target for Success:** I anticipated that about 70% of the class would answer this question correctly.	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met A total of 17 students took the final exam. Out of those students, 12 answered the problems correctly (around 71%). (12/21/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Overall, I was satisfied with how students answered this problem. One of the biggest issues was with students applying the distribution law correctly with the "-3" and changing the signs of the terms inside of the parenthesis. This last quarter, more students than I anticipated had a difficult time changing the signs of the various terms inside of the parenthesis when solving linear equations. I was happy to see that a number of the students who struggled with this concept earlier in the quarter were able to fix this problem for the final exam.	**Enhancement:** Nest time I teach Math 210, I will make sure to do more examples in class to show the students how to correctly change the signs of the terms inside of the parenthesis. I also plan on assigning more homework questions that require the students to be careful with how they change the signs of the terms within the parenthesis. (12/21/2017)

MATH 212:College Math Preparation Level 2: Beginning Algebra

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MATH212_SLO_1 - Evaluate real-world situations and distinguish between and apply linear and quadratic function models appropriately. **SLO Status:** Active	**Exam - Course Test/Quiz -** The only time that the students encounter applications in a mixed context (linear models, quadratic models, and linear systems) is on the final examination. The last six questions on the final were a scrambled mix of these applications with each category being waited equally. The questions were scored out of a combined 45 points. **Target for Success:** Although a target of 70% seems like a natural goal to determine if students sufficiently understand this student learning outcome, it ignores the extra stress and anxiety placed upon students when taking a cumulative exam that represents 30% of their grade. For this reason, I have set the target for success at 60%. The past three Math 212 classes I have taught have seen about two thirds of those taking the final passing the course. For this reason my target for success is that 70% of those students taking the final will score 27 points or higher on the last six questions of the final.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Not Met Out of the 45 students across two classes who took the final, only 11 of them received a score of 27 or better. Only 24% of students met the target. (10/20/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** This was a difficult quarter with difficult outcomes. In reflecting with many different people, I found that Spring is often a difficult quarter for developmental math students. However, when I compare the data with the assessment taken in Fall of 2012, I see only a drop of 12%. There seems to be a fundamental disconnect between the math problems and their real world applications. The largest problem encountered this quarter was student engagement. Even with participation an active part of their grade it was difficult to maintain attendance particularly in the noon section. As students performed generally more poorly in this quarter than during previous times I have taught the class it is difficult to pinpoint what else was different. Students seemed to have trouble holding onto material from one exam to the next.	**Enhancement:** To distinguish between different function models students need to be able to remember how to work with each of them. Since students are forgetting material as it is taught, I will try to implement more circular review in the future. (01/12/2015)
		Program Review Reporting Year: 2012-2013 **Target :** Target Not Met To understand and translate word problems in to mathematical equations and then use of the concepts and ideas (formulas) covered in Math 212, solve the problems. The Method of assessment was an exam on November 29/ 2012 for 26 students base on word problems and applications. The success target was set for 70% and the actual outcome was only 65%. So, the target was not met (02/04/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The reason that I did not meet the success target was mainly do to the practice exam that I gave them a week before the exam date in order for them to study it during the weekend. On Monday before the exam date I asked them if there are any questions on the practice exam and only couple of them	

needed help. Even though, I had solved few of the problem in class I did not put strong emphasis on the importance of practicing the practice exam.

Program Review Reporting Year: 2012-2013
Target : Target Not Met
Out of 77 students enrolled in two Math 212 sections, 66 took the final. The scores ranged from 0 to 45 with an average score of 23.7. Only 36% of students me the target score of 27 or above. Since the average score was 53%, we also looked at the percentage of students who scored 50% or above. This lowered criterion still only found 56% of students meeting the target. (12/13/2012)
Reflection (CLICK ON ? FOR INSTRUCTIONS): The results of this assessment was demoralizing particularly when considering the increased emphasis placed on applications this quarter over previous quarters. In trying to understand where the gap was occurring I went back through the materials. Two thirds of the SLOs emphasize applications. Applications account for one quarter of the students grades. One out of every six lecture hours was dedicated to applications. One out of eight sections covered in the text emphasized applications. There seems to be a gap between the pedagogy for the course and the expectations. It would also be remiss not to consider the fact that this assessment is based on the very last questions considered in the course. The last six problems on the exam were far and away the most skipped questions on the exam. However, the applications are placed last to keep from discouraging students during their final and promoting the best possible results for the students.

Enhancement: Restructure the course to introduce applications before students have learned to solve them, so that the process of learning algebraic techniques remains grounded in the real-world applications. (09/23/2013)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	Project - Project 1 - Linear Equations: Determine Three different equations of lines through data in scatterplot of data. (Two they pick any two points from the given data and find the line through the points. On the third they find the 'best fit' line by eyeballing the points.) **Target for Success:** 70% of students will get better than 70% on the project.		
	Exam - Course Test/Quiz - There were 8 open ended questions. Some were short such as finding the cost of an item on sale with taxes. Students were given 25 min. and then 5 min. to discuss with a partner. **Target for Success:** At least 70%of the students would earn 70% or better.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Not Met Only 62% of the class earned scored 70% or better. Students were able to distinguish between Linear and Quadratic functions and Evaluate values in the setting of a very similar problem presented in lecture but did very poorly at applying either function models when the application was not extremely similar to any shown in class. Roughly 50% of the quiz takers left the two application problems blank (04/16/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The results may have been confounded by the fact that out of a class of 39 only 18 students showed up consistently. This means that students who missed lecture and never caught up with notes or handouts/computer assignments produced very low scores. Since students struggle with applications I need to spend more time breaking down the wording so that students know which type of model to apply.	
	Other - Students were presented with familiar real-life examples involving two variables and data. Each group should be able to effectively communicate (either written or verbal) what type of model made sense and then analyze their data to decide if the data sort of fit the model (scatter plot). **Target for Success:** Each group is	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met All groups were able to determine which type of variation fit each problem. Approximately 1/4 of the groups (2-3 students) needed assistance analyzing the data to determine if the relationship was linear, quadratic or neither. (08/04/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** In this first attempt to address this SLO in a non-traditional Algebra class I only chose 3 familiar real-life relationships. I should	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	able to justify their decision and show how they used the data to determine if the relationship was linear, quadratic or neither.	include more so that there is not just one of each type. The group presentations relieved the stress of presenting and allowed students to discuss mathematical concepts. I will continue this way of assessing this SLO.	
	Exam - Course Test/Quiz - While the exam has 10 problems on it I will only be looking at one word problem. The question involves a system of linear inequalities. The student must define the variables, determine the inequalities needed, graph the inequalities including shading the appropriate areas, find a feasible point and write a sentence that describes what that point means in relation to the problem. **Target for Success:** I expect 80% of the students to be able to accurately define the variables, 70% of the students will be able to get the two of the 4 inequalities needed, 70% graph and shade the inequalities accurately and 70% will write a sentence that answers the question asked.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Not Met Only the defining variables target was met, it being 87%. The other categories were 33%, 12%, 7% and 14%. (11/07/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Actually my expectations were far too high for this type of problem. It is apparent I need to spend more time in class working systems of inequalities and that the students need to spend more time doing these types of problems outside of class. I will also look at rewording the problem to better lead the student to the correct solution.	
	Project - For linear models, students did a group project involving Blood Alcohol Level (BAC)and Legal Driving Limits. They needed to set up linear equations based on starting a BAC and the rate that the body metabolizes the alcohol over time. They then analyzed a scenario concerning an actual DUI case and decide whether they thought the person was guilty of a DUI. Students wrote a paragraph using mathematics to justify their conclusion.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met On the project, 78% of the students scored 40 out of 50 or higher and 50% scored 45 out of 50 or higher. There were two groups (6 students) who scored 100%. One group of 2 students scored at the C level and two groups (6 students) scored below passing (below 30 points). On the worksheet, 80% of the students scored 9 out of 10 points or higher. Of the remainder, 2 score 8 out of 10, 1 scored 7 out of 10 and 1 scored less than passing. There were 3 students in the class who were not present for the assessment. (12/07/2013)	**Enhancement:** I have rewritten the second part of the project to provide more direction to the students when analyzing the scenario. Instead of making suggestions for points they might want to consider, I have provided a series of equations and calculations for them to do. This should help them with the analysis part. For the worksheet, I feel that even though several students needed

|---|---|---|---|
	For quadratic models, students completed a worksheet comprised of two quadratics models. They had to make various predictions based on the model and then interpret their results in a sentence. Students worked in groups on this assessment. **Target for Success:** Success on the project was scoring at least 40 points out of 50. Success on the group worksheet was scoring at least 9 out of 10 points.	**Reflection (CLICK ON ? FOR INSTRUCTIONS):** For the most part, students did reasonably well on the project. Most groups were able to set up the required linear equations, graphs and make the predictions. The students who scored poorly did not complete a major part of the assignment, despite time given in class to work on the project. There were two areas that students had trouble with. In one part they needed to use a linear equation to do a retrograde analysis and predict a BAC prior to the time the blood alcohol level was tested. Students did not realize they needed to substitute a negative value for the time in order to do that. The second area that students had difficulty with was analyzing the scenario. Many did not know how to apply the principals they had learned to the actual situation. They also had difficulty looking at how the different facts impacted the BAC of the defendant. On the worksheet, most students did well. Many students did need help in getting started on the problems, since it put together many concepts we had been studying into one worksheet. Many students also needed help in writing sentence to interpret their results.	help in completing the assignment, they benefitted greatly and learned a lot by completing the assignment in groups. I will continue to do this assignment in future years. (12/07/2014)
	Project - Students will complete a project in groups of 3 where they create a scatterplot and then choose two different sets of points and find the equation of the line. They will then draw the 'best fit' line and find the equation of that line. Comparison questions will be answered **Target for Success:** 90% of the projects will have a score of 80% of better.	**Program Review Reporting Year:** 2017-2018 **Target :** Target Not Met 80% average of those who complete; four are in the process of re-doing the assignment; 10 are still working on the first submission. (11/14/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** XXXXX	
		Program Review Reporting Year: 2013-2014 **Target :** Target Met 1 group got a 64% and one group didn't turn in the assignment. Of the rest all had scores over 80%. (03/27/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Despite all the in class time to complete this project, there was one group	

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
		who didn't even bother to turn it in and another who put little effort into the project. The other groups did a great job!! I do need to spend more time discussing 'best fit' line the next time I do this project.	
	Exam - Course Test/Quiz - The only place they really need to distinguish between linear and quadratic is on the final exam. Therefore two of the problems will be looked at. One concerning linear and the other quadratic (obviously.) **Target for Success:** I would expect at least 50% of the students to get both questions correct.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Not Met Only 4 out of 18 students got the quadratic question correct. 12 out of 18 got the linear question correct (03/27/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Surprizingly since the quadratic was talked about right before the final exam, only 4 students got the question correct.	
	Exam - Course Test/Quiz - Final exam will look at quadratic and linear equations. pizza **Target for Success:** 70% of students will get the linear and quadratic questions correct.		
	Exam - Course Test/Quiz - I have given them two problems in a test to evaluate Student Learning Outcome 1. **Target for Success:** 70% of students received full credit on those problems.	**Program Review Reporting Year:** 2014-2015 **Target :** Target Met 83% of students received full credit on those two problems (11/14/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** It is great to see students can distinguish between linear and quadratic function models and can apply it to a real-world situations. I enjoy to see my students can make connections between math and the real-world situations.	
	Exam - Course Test/Quiz - Students are required to do the related topics as homework assignments, The linear and quadratic function applications are on quizzes, test 1 and the final exam.	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met About 90% people can do related questions on quizzes correctly and at least 70 % can do the similar questions correctly on tests (04/01/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** study habits effect the long term recall.	**Enhancement:** continue to motivate students to study (04/01/2017)
	Exam - Course Test/Quiz - On the final exam, I wanted to test the students on how well they	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met A total of 31 students took the final exam. Out of those	**Enhancement:** Next time I teach the class, I need to spend more time at the beginning of the

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	understood how to setup and solve an application of a linear inequality. The problem from my final exam is as follows: Your car is worth $1,200. You find out that your car needs some repairs. The auto shop tells you that the parts cost a total of $260, and the labor cost is $50 per hour. If the repairs are more than the car is worth, then you are going to donate your car to charity. Write an inequality that can be used to determine the maximum number of hours the mechanic can spend working on your car, and then solve the inequality. Interpret your answer in a complete sentence. **Target for Success:** I anticipated that at least 70% of the students would answer this problem correctly.	students, 21 students either answered the question perfectly (16 of the 21) or missed only a point or two in trying the solve the inequality (5 of the 21). So, about 68% of the class did a more than satisfactory job of answering this question correctly. (12/21/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** While I did have close to 70% of the class answer this question correctly, I was a bit surprised that there were fewer than 70% of the students who answered it completely correctly. For the first midterm, I put a somewhat similar problem on the exam that asked the students to construct a linear inequality from a word problem. A large number of the students were not able to construct the linear inequality for that problem, even though most of the students did not have an issue solving the linear equations in the other parts of the exam.	quarter, as well as at the end of the quarter, discussing these types of problems with students. I also think that I need to assign more homework and review problems that mirror the problem I asked on my final exam. (12/21/2017)
	Exam - Course Test/Quiz - For this method, I used a final exam question from the final exam which required students to find the equitation of a line given two points on the line. **Target for Success:** My target for success is that the average score for this problem be a 70% or above.	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met After tallying the scores for the problem given, the average score was a 77.52%, meaning on average, a student got 77.52% of the problem correct. I was very pleased with this. (01/22/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I will continue to teach this type of problem in a similar way. **Related Documents:** SLO Data.xlsx	
	Exam - Course Test/Quiz - I will use word problems on exam 3 to assess this method **Target for Success:** 60% of the class will receive a 70% or higher on the word problems	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met 62% of the class received a 70% or higher on the word problems. (03/28/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The target was met and I felt like the word problems were a could way to evaluate this SLO.	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
MATH212_SLO_2 - Analyze, interpret, and communicate results of linear and quadratic models in a logical manner from four points of view - visual, formula, numerical, and written. **SLO Status:** Active	**Exam - Course Test/Quiz -** As the Math 212 course is focused around linear and quadratic functions, the cumulative final seemed the best way to assess the students? abilities to analyze, interpret, and communicate results about these models in the four-fold way of thinking about functions. **Target for Success:** Although a target of 70% seems like a natural goal to determine if students sufficiently understand this student learning outcome, it ignores the extra stress and anxiety placed upon students when taking a cumulative exam that represents 30% of their grade. For this reason, I have set the target for success at 60%. The past three Math 212 classes I have taught have seen about two thirds of those taking the final passing the course. For this reason my target for success is that 70% of those students taking the final will score 60% or higher on the final.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Not Met Across two sections only 20 out of 45 students scored 60% or higher on the final. The 44% who passed is well below the target of 70% (10/20/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** This was a difficult quarter with difficult outcomes. In reflecting with many different people, I found that Spring is often a difficult quarter for developmental math students. There was a marked difference between success on this assessment as compared with Fall of 2012 (74%). The largest problem encountered this quarter was student engagement. Even with participation an active part of their grade it was difficult to maintain attendance particularly in the noon section. As students performed generally more poorly in this quarter than during previous times I have taught the class it is difficult to pinpoint what else was different. Students seemed to have trouble holding onto material from one exam to the next.	**Enhancement:** Since students are forgetting material as it is taught, I will try to implement more circular review in the future. (01/12/2015)
		Program Review Reporting Year: 2012-2013 **Target :** Target Met Out of 77 students enrolled in two Math 212 sections, 66 took the final. The scores ranged from 32% to 99% with an average score of 70%. Almost three quarters (74%) of the students scored 60% or better on the final. Half of all students scored 70% or better. Only one student scoring 60% or better on the final (in this case 64%) failed to pass the class. (12/13/2012) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The correlation between the target for success in this student learning outcome and passing Math 212 seems to indicate that the target for success was accurately chosen. Still, it would be nice to see an assessment that could be judged on more traditional expectations of mastery. Hidden in the assessment data is the fact that 14% of students present at the census did not even make it to the final. If the 11 students who did not take the final were considered to have scored a 0 then the percentage of those meeting the target would drop to 64%, which was below the target for	**Enhancement:** Develop a more targeted assessment that can help mitigate student anxiety. If using the final as an assessment again in the future, consider not only those students who are taking the final, but also those students who have taken all of the midterms. Treat a student who has taken all previous exams, but does not take the final as having a score of 0 for the purposes of this assessment. (09/23/2013)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		success. Indeed, some of those students should be counted as having a 0, students who attended up until the end of the course who decided they couldn?t pass. However, these students should be differentiated from those who quit coming halfway through the quarter.	
	Project - Project 1 - Linear Equations: Because the students are calculating the equations of lines they need to first graph the scatterplot and then use the proper formulas to find the equations of three lines. They are also asked to compare the lines they've found in complete sentences. **Target for Success:** 70% of students will get better than 70% on the project.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met 94% of students got better than 70% on the project (02/12/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Looks like they did well.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Met The method of assessment was video taping the solution of few problems project. The target of success was set for 90% for 26 students on December /4/2012. The actual percentage went over 92%. So, the target success was met. (02/04/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The reason of success, partly was due to the student's interest on video taping the solution of the questions given to them and their interest on creating their own way of communication.	**Enhancement:** I was happy about the result of the project and I will develop new strategies to better the format of the future projects. (02/04/2013)
	Other - Students spent two days(inside and outside of class) working collaboratively on a Worksheet containing the following types of problem activities 1)Graphing and Recognizing key attributes of the Graphs 2)Creating functions from graphs and then using them to answer questions with correct function notation 3)Examining and comparing tables that were derived from either a linear or quadratic relationship and then writing down the numerical	**Program Review Reporting Year:** 2013-2014 **Target :** Target Not Met Only 68% of the students completed the worksheet. The average score on the worksheet including those that did not finish was 64%. However, of those groups that completed the worksheet the average score was 81%. (04/17/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Many students did not finish the worksheet. Although I gave extra credit to those that used the tutorial center, I could have had the in-class tutor make a stronger connection by finding a time when he could meet with the students in the tutorial center. Regarding the performance for those who did finish I could have given an extra day in class and provided some hints for the harder problems.	

	difference in (complete sentences). 4)Solving an application problem using key attributes of the linear or quadratic function and then writing 2 complete sentences **Target for Success:** At least 90% of the students would complete the group worksheet (some of which was done in class) and get at least an 80% overall score		
	Exam - Course Test/Quiz - Given the final has the following types of problems: identifying shapes of graphs, reading linear and quadratic graphs, Evaluating functions from a graph and the formula, constructing models from a table and writing linear and quadratic models from a story, I decided to use a set of questions from the final to assess this SLO. **Target for Success:** Given the 17 questions on the final which fall into one of the categories in the assessment method described above, each student should earn at least 70% (or at least get 12 questions correct) of the set of 17 questions.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Not Met Of the 32 students that took the final 29 students answered 12 or more of the 17 questions correctly. (08/04/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Most of the students not earning 70% had trouble answering questions that require students to read graphs to answer the problem in the story. I will do more sample problems.	
	Exam - Course Test/Quiz - While the exam has 10 problems on it I will only be looking at one word problems. The question is a simple interest problem involving a system of linear equations. The student must define the variables, determine the equations needed, solve the equations and write a sentence that answers the question asked.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Not Met First target was met with 86% defining the variables correctly, getting the equations was far below target at 18% while solving (I gave credit if they solved their incorrect equations correctly) the equations was close at 64%. I was surprised that only 64% wrote a sentence. I figured they would at least write something to get some partial credit. (11/07/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** More time	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	Target for Success: I expect 80% of the students to be able to accurately define the variables, 70% of the students will be able to get the two equations needed, 70% will solve the system correctly and 90% will write a sentence that answers the question asked.	needs to be spent in class and by the student outside of class working these types of problems. The question itself was pretty clear so I don't think that needs editing.	
	Project - For linear models, students did a group project involving Blood Alcohol Level (BAC)and Legal Driving Limits. They needed to set up linear equations based on starting a BAC and the rate that the body metabolizes the alcohol over time. They then analyzed a scenario concerning an actual DUI case and decide whether they thought the person was guilty of a DUI. Students wrote a paragraph using mathematics to justify their conclusion. For quadratic models, students completed a worksheet comprised of two quadratics models. They had to make various predictions based on the model and then interpret their results in a sentence. Students worked in groups on this assessment. **Target for Success:** Success on the project was scoring at least 40 points out of 50. Success on the group worksheet was scoring at least 9 out of 10 points.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met On the project, 78% of the students scored 40 out of 50 or higher and 50% scored 45 out of 50 or higher. There were two groups (6 students) who scored 100%. One group of 2 students scored at the C level and two groups (6 students) scored below passing (below 30 points). On the worksheet, 80% of the students scored 9 out of 10 points or higher. Of the remainder, 2 score 8 out of 10, 1 scored 7 out of 10 and 1 scored less than passing. There were 3 students in the class who were not present for the assessment. (12/07/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** For the most part, students did reasonably well on the project. Most groups were able to set up the required linear equations, graphs and make the predictions. The students who scored poorly did not complete a major part of the assignment, despite time given in class to work on the project. There were two areas that students had trouble with. In one part they needed to use a linear equation to do a retrograde analysis and predict a BAC prior to the time the blood alcohol level was tested. Students did not realize they needed to substitute a negative value for the time in order to do that. The second area that students had difficulty with was analyzing the scenario. Many did not know how to apply the principals they had learned to the actual situation. They also had difficulty	**Enhancement:** I have rewritten the second part of the project to provide more direction to the students when analyzing the scenario. Instead of making suggestions for points they might want to consider, I have provided a series of equations and calculations for them to do. This should help them with the analysis part. For the worksheet, I feel that even though several students needed help in completing the assignment, they benefitted greatly and learned a lot by completing the assignment in groups. I will continue to do this assignment in future years. (12/07/2014)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		looking at how the different facts impacted the BAC of the defendant. On the worksheet, most students did well. Many students did need help in getting started on the problems, since it put together many concepts we had been studying into one worksheet. Many students also needed help in writing sentence to interpret their results.	
	Project - Project 1 - Students (working in groups) will create a scatterplot and then pick two points and find the equation of that line. They'll repeat this and then compare the lines they found. Finally they will do their best 'eye-ball' line (emulating linear regression) and find the equation of that line and compare it to the first two. pizza **Target for Success:** 90% of groups accurately complete the project.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met One group did not turn in the assignment and 1 other was below the 70% goal. Meaning that 94% of the students got better than 70% on the project. (02/12/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I spent a great deal of time working with the students in class on this assignment which much improved performance over past quarters. Still need to work on making sure everyone understands the process.	**Enhancement:** Editing the project instructions for next time I use it so it is more clear on what students are to do when it comes to best fit line. (02/12/2013)
	Project - Project 2. Students complete 3 systems of equations problems and 1 systems of inequality problems. Create poster board presentations of the problems and present one problem to the class acting at 'teacher'. pizza **Target for Success:** 80% of groups will complete with a score of 70% or higher		
	Exam - Course Test/Quiz - I have given them 4 problems in a test to evaluate Student Learning Outcome 2. **Target for Success:** 70% of students receive full credit on those problems	**Program Review Reporting Year:** 2014-2015 **Target :** Target Met 35 out of 40 students got all of them correct, which that is about 88% (12/05/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** It is important that students learn every math topic from different points of view-visual, formula, numerical and written, in order to make a better connections in their brain to help them with	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		their future math classes, job and life in general.	
	Exam - Course Test/Quiz - Students are tested these areas on quizzes and tests throughout the quarter	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met more than 90% can do questions correctly on quizzes, about 75% students do well on these areas on the tests (04/01/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students who spend required amount of time to study are successful on all forms of tests	**Enhancement:** continue to motivate students to spend time to study. (04/01/2017)
	Exam - Course Test/Quiz - For this method, I used a problem (again) from the final exam which required students to graph a quadratic model showing all points of interest, vertex, x and y intercepts, and so forth. **Target for Success:** Target for success is that the average points achieved on the problem will be above 70%.	**Program Review Reporting Year:** 2017-2018 **Target :** Target Not Met For this problem, the students did not do so well. The average percentage of the point achieved was a 53.49%. This was a little disappointing. The problem given was not too difficult and the students had reviewed such problems just before the final exam. (01/22/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** For this type of problem, I need to try something new when teaching it. I think because the problem does require both new and older skills learned during the quarter, it's more difficult than usual. **Related Documents:** SLO Data.xlsx	
	Exam - Course Test/Quiz - I will give the students a quiz that focuses on this assessment. There will be 5 problems that will ask them to analyze, interpret, and communicate results of linear and quadratic models in a logical manner from four points of view - visual, formula, numerical, and written. **Target for Success:** 60% of the students will receive a 70% or higher on the 5 problems.	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met 68% of the students received 70% or higher on the problems. (03/28/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I will use this method the next time I teach 212. The students did well on these problems	
MATH212_SLO_3 - Demonstrate an appreciation and awareness of applications in their daily lives. **SLO Status:** Active	**Portfolio Review -** Throughout the quarter students were asked to write a question from the context of	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met Of the 53 students who turned in portfolio problems, 49 of	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	their own lives that could be answered using linear models, quadratic models, and a system of linear equations. These were scored on a 10 point rubric that evaluated the questions for solvability, context, realism of the values used, and originality of the question. The average score on this portfolio of questions will be used to assess the SLO. **Target for Success:** In order to move on to Math 114, I would hope that a student would average a 6 across the three written questions. The past three Math 212 classes I have taught have seen about 66% of those completing the course passing. For these reasons my target for success is that 70% of those students completing the course will average a 6 or higher on their portfolio.	them averaged a 6 or better. However, only 23 of the 53 students turned in all three problems. 20 students turned in 2 problems and the remaining 10 turned in only one problem. (10/20/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** When students participated in the portfolio they seemed to really engage with the material. They enjoyed taking applications from their video games and bachelorette parties and all the other personal facets of their lives to write math problems. However, participation remained a problem. There was a great deal of difficulty in getting them involved. Less than half the students completed all three portfolio problems, despite the problem being worth 10% of a midterm grade in each case and having several days to work on it. If this is indeed a factor of the Spring quarter, then we need to find new ways to compete with the weather at this time of year.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Met Out of 77 students enrolled in two Math 212 sections 69 turned in a portfolio. The portfolio scores ranged from 4.0 to 7.7. A score of 6.0 or better was attained by 77% of these students. Only 30% of the students scored 7.0 or higher. (12/13/2012) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students showed a tendancy to follow the path of least resistance. As a result, they wrote a lot of questions that, while coming from the context of the world around them, were hard to believe the student might actually care about answering. Although they are connecting these applications to the real world, there seems to be a disconnect in their numeracy. They tend to choose values that have no connection with their chosen context, but which make for easy calculations. In short, their questions tend to resemble traditional word problems rather than true applications. Students found it much harder to see quadratic models in the world around them as opposed to linear models. It does appear that their ability to connect their questions to things that interest them (sports, hobbies, jobs, etc.) increased their engagement in the material.	**Enhancement:** Students might benefit from learning how to set up mathematical models before they develop the skills to solve them. In this way it would be easier to concentrate on meaningful values and help encourage their numeracy. This might also help introduce the students to the way these questions are developed (as opposed to "extracting" an equation from a paragraph). (09/23/2013)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	Project - Project 1 - Linear Equations: As par of this assignment, students are asked to reflect on what they learned and how they contributed to completing the group project. **Target for Success:** 100% of student will complete the reflection, short essay.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met As of this date, Only 94% of the students have turned in their reflections. This will be up to 100% by tomorrow, since the students will not get credit for the assignment if they don't turn in the reflection. (02/12/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Need to emphasize the importance of the reflection next time I do this project.	
	Focus Group - Focus Group Discussion based on a short Survey of 2 questions 1) Did you appreciate the applications that were familiar in your life? 2) What other types of relevant application problems would you like to learn to solve? **Target for Success:** At least 70% would prefer application problems relevant to their daily lives than other problem types required in the course.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Not Met Of the 26 students that responded 2/3 preferred problems relevant to their lives over other application problems. Only 4 out of the 26 preferred relevant life application problems over other application problems and only 3 wanted any additional application problems relevant to their lives. One student asked if I could teach him how to find the best car loan. (04/17/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** : I was unrealistic regarding the difficulty with any type of word problem at this level even when it was applicable to something in their lives. Most of the students just wanted to get through the math so desperately that anything that was harder was not worth as much as just 'doing the math' and not thinking about the word problem.	**Enhancement:** Next time when teaching a traditional Math 212 course I would have students try to solve a relevant daily life problem in the first few days of the quarter. For instance I might ask which is a better deal under different circumstances. I would record the time to reach a solution and the solution. At the end of the quarter I would give them the same problem and insist that they use any math they learned in the course. I would allow them to use learning material from the course. Again, I would record the time to find a solution. I would have them write a paragraph comparing the time spent and the quality of the solutions. (04/17/2013)
	Other - In the last week of the quarter students will collaborate in groups of 2 -3 to answer worksheet questions. Questions on the worksheet contain real-life applications. After completing the worksheet each group will answer two questions: 1. What percent of the problems on the worksheet were relevant to your		

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
	daily lives? 2. What percent of the problem solving techniques for these real life applications will you actually use once done with the course? **Target for Success:** 1. The average percent of problems found useful is at least 75% 2. The average percent of techniques used outside this course is at least 50%		
	Exam - Course Test/Quiz - While the exam has 10 problems on it I will only be looking at two word problem. One dealing with simple interest with a system of linear equations, the other with a system of linear inequalities. **Target for Success:** As a way of 'seeing' student awareness of applications, I expect that at least 80% of the students will at least attempt to do part of each problem.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met Well over the stated goal was obtained as 92% of the students attempted the interest problem and 96% of students attempted the inequality problem. (11/07/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I was very pleased that almost all students made and attempt at these word problems. Most just defined the variables but that is a great start!!	
	Project - Students did a group project involving Blood Alcohol Level (BAC)and Legal Driving Limits. They needed to set up linear equations based on starting a BAC and the rate that the body metabolizes the alcohol over time. They then analyzed a scenario concerning an actual DUI case and decide whether they thought the person was guilty of a DUI. Students wrote a paragraph using mathematics to justify their conclusion **Target for Success:** Successful groups will score at least 40 points out of 50 on the group project	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met 78% of the students scored 40 out of 50 or higher and 50% scored 45 out of 50 or higher. There were two groups (6 students) who scored 100%. One group of 2 students scored at the C level and two groups (6 students) scored below passing (below 30 points). (11/15/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** : For the most part, students did reasonably well on the project. Most groups were able to set up the required linear equations, graphs and make the predictions. The students who scored poorly did not complete a major part of the assignment, despite time given in class to work on the project. There were two areas that students had trouble with. In one part they needed to use a linear equation to do a	**Enhancement:** I have rewritten the second part of this project to provide more direction to the students when analyzing the scenario. Instead of making suggestions for points they might want to consider, I have provided a series of equations and calculations for them to do. This should help them with the analysis part. For the retrograde analysis, I will make sure as I help students that I emphasize that time is negative

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		retrograde analysis and predict a BAC prior to the time the blood alcohol level was tested. Students did not realize they needed to substitute a negative value for the time in order to do that. The second area that students had difficulty with was analyzing the scenario. Many did not know how to apply the principals they had learned to the actual situation. They also had difficulty looking at how the different facts impacted the BAC of the defendant.	when going back in time. (12/07/2014)
	Exam - Course Test/Quiz - Looking at one problem on Quiz 4 dealing with finding the original price of a phone. Students will understand the concept of reduction in price. **Target for Success:** 95% of students will get this question correct.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Not Met Only 6/21 students got this question correct. (02/03/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Not exactly sure what else can be done other than having students practice more of these types of problems. I was rather surprised that the number who got it right was so low as we have done several of these types of problems in class and in the homework.	
	Exam - Course Test/Quiz - Exam 1 Problem on investment problem **Target for Success:** At least 70% of the students will do the problem correctly.	**Program Review Reporting Year:** 2014-2015 **Target :** Target Met 71% of the students were able to do the problem by accurately defining the variables, find the system of equations, solving and answering the question with a sentence (11/06/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Quite pleased with how the students did with this problem.	
	Project - I gave them a project to examine three different cellphone company career and choose which one is more suitable with their needs. They could do the project in group or individually, but they had to submit their final work individually. **Target for Success:** At least 80 percent of students complete the project with a grade of 90% or better.	**Program Review Reporting Year:** 2014-2015 **Target :** Target Met 36 out of 40 students about 90% turned in the project completed and scored above 90% (11/19/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** This project made them think of how basic algebra knowledge can help them with their everyday life problems and decision makings. The majority of them did the project in group of two or three, that help them to make friends for that class and other classes they take in future, as some of them reported.	
	Exam - Course Test/Quiz -	**Program Review Reporting Year:** 2016-2017	**Enhancement:** continue to

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	homework are related to these areas and points are given for doing the problems	**Target :** Target Met almost all students showed up for the final exam finished the 90% of homework (04/01/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** more skills lead more appreciation	motivate students to spend time on homework (04/01/2017)
	Exam - Course Test/Quiz - For this assessment, I again used a problem from the final exam. It was a true application problem (mixture problem) that required students to set up and solve an application. **Target for Success:** Target for success is again, that the average points obtained on the problem will be a 70% or above.	**Program Review Reporting Year:** 2017-2018 **Target :** Target Not Met For this problem, the average points obtained per student was a 52.62%, short of the 70% I was hoping for success. (01/22/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Again, the average points obtained fell short of the target. This problem involved skills that were taught earlier in the class only. I would have thought that students would have done better since those skills had time to sink in. I think in the future, I might return to those skills at the end of the quarter (time permitting) and review before the final exam. **Related Documents:** SLO Data.xlsx	
	Project - I had the students complete a groupwork that had them apply what we are learning to a plane trip they can take to Hawaii. **Target for Success:** The students will complete this project during class and 80% of them should receive a 70% or higher	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met 82% of the students received a 70% or higher on the project. (03/28/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The students enjoyed this project and I plan to use it again in the future!	

MATH 217:Integrated Statistics 1

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MATH217_SLO_1 - Organize, analyze, and utilize appropriate methods to draw conclusions based on sample data by constructing and/or evaluating tables, graphs, and numerical measures of characteristics of data. **SLO Status:** Active **Outcome Creation Date:** 09/12/2013	**Laboratory Project -** Students are asked to construct graphs and descriptive statistics from raw data using Minitab, and then analyze and explain the results in non-statistical language. **Target for Success:** 90% successful completion of project	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met 95% of students successfully completed project (12/11/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Assignment was successful, students were engaged and productive.	
	Laboratory Project - Students create boxplots using MINITAB from several numeric sets of data. Students then compare and explain each data set for center, spread and shape. **Target for Success:** 90% complete	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met All students were able to complete this lab successfully. Students could clearly explain medians, quartiles and interquartile range as well as skewness. (03/20/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** All agreed this was one of the better assignments, no enhancements necessary	
	Demonstration - Students are required to compare two sets of NBA scoring data where the basketball was changed. Students compare graphs and descriptive statistics to determine if the change in basketball affected the average, variation and skewness of the points scored. Students need to draw conclusions from the graph and statistics in the context of the problem. **Target for Success:** 90% of students successfully complete the demonstration.	**Program Review Reporting Year:** 2014-2015 **Target :** Target Met All students were able to complete most of this project successfully. (12/04/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Results were discussed with Statway team and ideas were shared about teaching this material in future courses.	
	Laboratory Project - This objective was analyzed using three computer labs. The students used Minitab to generate statistical graphs, tables, and numerical measures and then used these to analyze and make	**Program Review Reporting Year:** 2015-2016 **Target :** Target Met Lab 1: 84.2% of the students scored 90% or above on this lab. 3 students received 71% on the lab and 2 students did not complete the lab due to absence.	**Enhancement:** In the future, I will be more careful to make sure students are following directions and answering the questions in the lab. I will also remind students

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	observations about the data. Lab 1 was focused on Dotplots; Lab 2 was focused on descriptive statistics; Lab 4 was a simulation lab using histograms and various descriptive statistics to analyze the distribution of data. **Target for Success:** 70% of the students will score at least 80% on each of the labs.	Lab 2: All students scored at least 80% on this lab, with 53.3% scoring 90% or above. Lab 5: 90% of the students scored at least 90% on this lab. 2 students did not complete the lab due to absence (12/11/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** These labs were completed in groups and students by and large did quite well. Students lost points mainly because they failed to follow the directions. They would paste a graph from Minitab, but then would not make the conclusions asked for in the question. Also, for two of the labs, students were absent for the lab, resulting in a grade of 0 on the lab.	the importance of being present in class on lab days, or making arrangements to make up the missed lab. (12/11/2015)
	Laboratory Project - Students will create dot plots and histograms of numeric data with a categorical factor. The students will then describe the center, shape, spread and outliers of each graph and compare each level of the factor. **Target for Success:** 85% average grade on lab	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met Students were given data from the website Rate My Professor and asked to compare ratings of faculty based on division. Students were all successful in making the graphs and 90% of the students were able to make reasonable comparisons of the various divisions (differences in center, shape and spread as well as outliers.) (03/28/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students demonstrated an excellent understanding of these concepts.	
	Laboratory Project - Students will use Minitab software to create histograms, dotplots and barcharts. From these graphs, students will discuss center, shape spread, outliers and other features. **Target for Success:** Students accurately answer 90% of questions		
MATH217_SLO_2 - Analyze and describe data distributions through the study of probability theory. **SLO Status:** Active **Outcome Creation Date:** 09/12/2013	**Exam - Course Test/Quiz -** Students will be assigned problems to identify and describe different probability distributions **Target for Success:** 75% success	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met Average score on assessment quiz = 77% (12/11/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** This is a challenging topic for students, but they did show a basic understanding of these distributions.	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	Project - Students will determine empirical probabilities for an unknown finite discrete random variable, and then compare results with other students to improve the estimate. **Target for Success:** 90% complete	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met 95% of students successfully completed the project although some intervention was needed so all students would participate. (03/20/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students should be encouraged to work on their own for 15 minutes before comparing answers.	**Enhancement:** Have more well-defined time limits for each part of the project (03/20/2014)
	Demonstration - Bayesian Probability Model - Students will build a hypothetical two way table of athletes being drug tested for performance enhancing drugs. From the incidence, specificity and sensitivity rates students will determine and explain in context the probability that an athlete who tests positive is actually using performance enhancing drugs. **Target for Success:** 90% completion	**Program Review Reporting Year:** 2014-2015 **Target :** Target Met 95% of students successfully completed the assignment. (12/04/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** example discussed with Statway team - all agreed it was an excellent use of Bayesian probability modeling.	
	Exam - Course Test/Quiz - This Student Learning Outcome will be assessed using two quizzes: The module 5 quiz on probability fundamentals, and the module 6 quiz on Probability Rules. **Target for Success:** 70% of students will score at least 70% on each quiz.	**Program Review Reporting Year:** 2015-2016 **Target :** Target Not Met Module 5 quiz: 63.1 % of students scored at least 70% on this quiz, with 47.3% scoring 90% or above. Module 6 quiz: 62.5% of students scored at least 70% on this quiz, with 31.3% scoring 90% or above. (12/11/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Material on probability is difficult for many students. They are confused by the notation and the probability rules are particularly difficult. Many students had difficulty choosing the correct probability rule to use in a given situation. Students also had trouble distinguishing between equally likely events, and events which were not.	**Enhancement:** In the future, I will give students more practice, particularly in using the probability rules. (12/11/2016)
	Demonstration - Students are given cross-tabulated exit poll information on the 2016 presidential election (candidate and Gender). Students are then to build a two way table using a radix 0f 100,000,calculate	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met 95% of students successfully completed assignment (03/28/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students like this assignment, but needed help with conditional	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	marginal, joint and conditional probabilities and determine if gender and candidate selection are independent or dependent events. **Target for Success:** 85% successfully complete assignment.	probability	
		Program Review Reporting Year: 2016-2017 **Target :** Target Met Students created the two way table based based on the exit polls and then compared the totals to the popular vote for verification. Students then showed that there was a clear gender gap in the results with Women overwhelming supporting Clinton and Men supporting Trump. (03/28/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students were very interested in this project as it was conducted right before the inauguration. The project also led to a discussion about recognizing the difference between inferences from real data and false claims or "alternative" facts.	
MATH217_SLO_3 - Evaluate real-world situations and apply linear, quadratic and exponential function models appropriately. **SLO Status:** Active **Outcome Creation Date:** 09/12/2013	**Demonstration -** Students will complete worksheets that demonstrate a knowledge of real world situations involving linear, quadratic and exponential models. **Target for Success:** 90% completion	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met linear model - 80% success exponential model - 70% success quadratic model - 85% success overall average 78% success (12/11/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** We felt that some changes should be made to the presentation of this material, especially the linear and exponential models.	**Enhancement:** Create new worksheets for linear and quadratic models and use them next quarter (W2014) (12/11/2013)
	Project - Students work in groups to build an appropriate model (linear, exponential or quadratic) from context rich scenarios. **Target for Success:** 90% completion	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met 95% of students completed assignment (03/28/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students worked with different data sets and using scatter plots were able to discern the models.	
		Program Review Reporting Year: 2013-2014 **Target :** Target Met Students were able to successfully work with linear and exponential models, but struggled with quadratic models. However, over 90% of students successfully completed the project (03/20/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** We felt the new supplemental material was a great improvement over	**Enhancement:** Add model building to quadratic handout (03/20/2014)

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
		FA2013 material, but there could be more examples of quadratic model building	
	Exam - Course Test/Quiz - Students are given data for several problems and are asked to 1) choose the appropriate model (linear, quadratic or exponential) that fits the data, 2) Find an equation to model the data, 3) Use the model to make predictions, 4) present answers in context. **Target for Success:** 75% success	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met Students were given examples of each three models: A gravity example fro quadratic, a depreciation example for exponential and a blood alcohol concentration example for linear. Using technology, the students derived the equations and used the equations to make predictions and explain the results in context. (03/28/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students were able to successfully tell the difference from the three models.	
		Program Review Reporting Year: 2014-2015 **Target :** Target Met Average score on quiz was 80%, some students had trouble with using the correct language in context, but most were successful in the traditionally challenging topic in algebra. (12/04/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Discussed quiz results with a colleague - we agreed the student success in working with rich context problems supports the productive persistence pedagogy used in Statway.	
	Exam - Course Test/Quiz - This learning outcome is being assessed through the results of Exam 2, which contained questions on linear and exponential models, as well as linear regression. The quadratic model is being assessed by the Quadratic quiz. **Target for Success:** 70% of the students will score 70% or higher on the exam and the quiz.	**Program Review Reporting Year:** 2015-2016 **Target :** Target Not Met Linear and Exponential models: 63.1% of students scored at least 70% on this exam. Of these, 15.8% scored above 90%, and another 31.6% scored between 80% and 90%. 7 students scored below 70%. Quadratic models: 76.4% of students scored at least 70% on this quiz, with 64.6% scoring above 90%. 4 students scored below 70%, of whom 3 were absent for the quiz. (12/11/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The scores for the linear and exponential models exam were just shy of meeting target. For these students, who had not taken an algebra course before, the material on exponential functions was difficult. Also, students often had trouble interpreting their results.	**Enhancement:** In the future, I will provide more practice on the aspects of algebra and interpretation of results for linear, exponential and quadratic models. Students need much more practice than that provided in the worksheets, so I will supplement with additional exercises. (12/11/2015)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		The scores on the quadratics quiz were much better, with students achieving the target on this assessment	

MATH 22:Discrete Mathematics

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MATH22_SLO_1 - Critique a mathematical statement for its truth value, defend choice by formulating a mathematical proof or constructing a counterexample. **SLO Status:** Active	**Exam - Course Test/Quiz -** Quiz 7: Students were asked to determine if a particular relation on the integers was transitive and/or symmetric, and to provide a proof if a property was true, and a counterexample if the property was false. In this case, the relation was symmetric but not transitive, so a proof and a counterexample were each required. **Target for Success:** Scoring at least 6 points out of 8 was considered success. (Identifying that the relation was not transitive, and providing a counterexample, were worth 3 points together; identifying that the relation was symmetric, and writing a proof, were worth 5 points together.)	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met A total of 42 students took the final exam. Out of those students, 27 students answered this problem correctly (about 64%). (12/21/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I was satisfied to see that I had more than 60% of the class answer this question correctly. These types of problems gave the students a difficult time on previous exams and quizzes because they were not asked to simply prove something was true or find a counterexample. Instead, the students needed to work with smaller examples that helped them gain insight into why a statement should be true or false. This taught the students how to patiently work through the various parts of the problem in order to gain a better understanding for why the statement in the problem is either true or false.	**Enhancement:** Next time I teach the class, I plan on spending more time having the students determine if a mathematical statement is true or false through in-class group work. This way they will have a better understanding of the definition they are working with and how to construct examples and counterexamples. (12/21/2017)
		Program Review Reporting Year: 2012-2013 **Target :** Target Met 76% of the students scored at least 6 points out of 8. 71% of the students scored at least 7 points out of 8. 29% of the students scored 8 points out of 8. (02/04/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The rate of success was acceptable. Almost everyone identified a relevant counterexample. Students who had difficulty with the question generally failed to follow the formal proof writing structure of stating hypotheses and invoking relevant definitions upfront. It might be worthwhile to add an exercise which focuses primarily on writing only the first line of a formal proof, and on translating statements using definitions (ie. x^2+3 is prime if and only if (fill in the blank), xRy if and only if (fill in the blank), x is not in A union B complement if and only if (fill in the blank).	
	Exam - Course Test/Quiz - On the final exam, the students were asked to determine if the "outer" function in a composition of two functions	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met 72% of the students were correctly able to identify that the outer function need not be one-to-one and were able to	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	must be one-to-one, given that the composite function is one-to-one. **Target for Success:** Given that 72% of the students did the problem fully correctly and and additional 16% identified the correct truth value, I would consider the target met.	produce a correct counterexample. 16% of the students were able to identify that the outer function need not be one-to-one, but were not able to produce an appropriate counterexample. 8% of the students responded that the outer function must be one-to-one and attempted to prove that. 4% of the students left the problem blank. (07/14/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Overall, this is quite satisfactory.	
	Exam - Course Test/Quiz - On the final exam, I wanted to test how well the students could determine if a statement would be true or not, and then have the students try and prove the statement if they thought it was true or create a counterexample if they thought the statement was false. The problem on my final exam was the following: If f: X->Y and g: Y ->Z are function and g o f: X->Z is onto, then must f: X-> Y be onto, as well? If so, prove it. If not, then give a counterexample. **Target for Success:** I anticipated that at least 60% of the students would answer this problem correctly.	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met A total of 42 students took the final exam. Out of those students, 27 students answered this problem correctly (about 64%). (12/21/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I was satisfied to see that I had more than 60% of the class answer this question correctly. These types of problems gave the students a difficult time on previous exams and quizzes because they were not asked to simply prove something was true or find a counterexample. Instead, the students needed to work with smaller examples that helped them gain insight about why a statement should be true or false. This taught the students how to patiently work through the various parts of problem in order to gain a better understanding for why the statement in the problem is either true or false.	**Enhancement:** Next time I teach the class, I plan on spending more time having the students determine if a mathematical statement is true or false through in class group work. This way they will gain a better understanding of the definitions they are working with and how to construct examples and counterexamples. (12/21/2017)
	Exam - Course Test/Quiz - On the final exam, students were asked to prove that if n is an even integer, then n^2 - 6n + 5 is an odd integer. **Target for Success:** My target for success was that 70% or more of the class get this problem correct or almost correct, meaning a score of 3 or higher out of 5 was considered successful.	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met Of the 39 students who took the final exam, 36 successfully answered the question. So, around 92% of the class answered this question correctly. (11/02/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The students did very well on this question, and I felt that this question did a good job of asking the students to construct a proof before they had to answer more complicated proof based problems.	**Enhancement:** For future classes, I would ask them a slightly more difficult question. (11/02/2019)

MATH22_SLO_2 - Analyze and apply

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
patterns of discrete mathematical structures to demonstrate mathematical thinking. **SLO Status:** Active	**Exam - Course Test/Quiz -** Quiz 7: Students were asked to identify the partition induced on a particular set of integers by an equivalence relation. **Target for Success:** Scoring at least 3 points out of 4 was considered success.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met All students scored at least 3 points out of 4. 88% scored 4 points out of 4. (02/04/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The rate of success was excellent. The only students who did not get a perfect score identified the equivalence classes correctly, but failed to write the final answer in proper notation.	
	Exam - Course Test/Quiz - On the final exam, the students were asked to prove that for any sets A, B and C, if C is a subset of B-A, then the intersection of A and C must be empty. This is a classic proof by contradiction, which requires the student to first correctly identify the negation of the statement and then come to a contradiction. **Target for Success:** I would like to have seen more students complete an indirect proof such as this one correctly. However, there definitely was evidence of correct or significantly correct mathematical thinking in the first two categories of students, 88% total, described above.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met 56% of the students were able to do the proof correctly or with one minor mistakes (5 to 6 points out of 6 points). 32% of the students were able to make good progress on the proof, but had one significant or two small errors (4 points out of 6). The errors mostly resulted from either not doing the proof by contradiction and attempting it directly, or by making an error at the start of the proof in assuming the correct negation. The remaining 12% of the students made rather insignificant progress, but showed some understanding (2 out of 6 points). (07/14/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Overall, the results were satisfactory.	
	Exam - Course Test/Quiz - On the final exam, I asked the students to prove that 3-5*sqrt(2) is an irrational number. The question before this one asked them to prove that the sqrt(2) was irrational, and the students were allowed to use this result for the problem. **Target for Success:** My goal was to have 70% of the students answer this question successfully. This meant that the students scored a 3	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met Of the 39 students who took the exam, 34 successfully answered the question. This means that about 87% of the class successfully answered this question. (11/02/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I was more than satisfied with the results for this problem. This pushed the students' understanding of how well they could apply their knowledge from a previous problem on the exam.	**Enhancement:** For future classes, I might change the problem slightly and ask them is they think the number is rational or irrational and then have them prove their answer. (11/02/2019)

| | or higher out of 5 points. | | |

MATH 23:Engineering Statistics

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MATH23_SLO_1 - Organize, analyze, and utilize appropriate methods to draw conclusions based on sample data by constructing and/or evaluating tables, graphs, and numerical measures of characteristics of data. **SLO Status:** Active			
MATH23_SLO_2 - Use calculus based mathematics to construct, analyze, apply, and simulate probability and sampling distributions in theory and applications, and to justify appropriate statistical analyses and inferential methods. **SLO Status:** Active			
MATH23_SLO_3 - Collect data, interpret, compose and defend conjectures, and communicate the results of random data using statistical analyses such as interval and point estimates, hypothesis tests, and regression analysis. **SLO Status:** Active			

MATH 241:Academic Excellence in Precalculus

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MATH241_SLO_1 - Analyze and develop linear, polynomial, exponential, logarithmic and implicit function models. **SLO Status:** Active **Planned Assessment Quarters:** 2012-13 2-Fall	**Exam - Course Test/Quiz -** Look at student performance on four MT #3 problems, in which students were asked to evaluate, graph, and transform algebraic & transcendental functions.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Out of 42 students taking MT #3, 11 students performed well (earning at least 90%) on all 4 problems, 8 students performed well on 3 of 4 problems, 9 students performed well on 2 of 4 problems, 7 students performed well on 1 of 4 problems, and 7 students performed well on 0 of 4 problems. (02/14/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** More emphasis needs to be placed on (i) algebraic manipulation, (ii) multiple representations of a function, especially graphical interpretation; (iii) transformations of parent functions; (iv) characteristics of parent functions, such as domain, range, intercepts, & symmetry.	**Enhancement:** I will allocate more time in class toward having students graph transformations of functions, labeling all of the key aspects of the graph and describing the effects on each from the transformations. I will also administer the same types of problems the next time I teach math 41 and track the progress made. (02/14/2013)
	Exam - Course Test/Quiz - Used 2 problems - one involving an exponential relationship & the other a logarithmic - to assess. Students were given a situation and asked what type of relationship there was between the variables & why; then, they used data to create a function & evaluated various values using the function.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met 60% of the class scored 90-100% 15% of the class scored 80-90% 10% of the class scored 70-80% 15% of the class scored <70% (01/24/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students were able to identify & explain the differences between exponential & logarithmic relationships reasonably well. They also did a good job computing the various values correctly. The most recurring issues were explanations of the differences & using the logarithmic function in an exponential equation to solve for unknowns.	
	Exam - Course Test/Quiz - 5 problems from exams 1-3 (1 each from the different function models) in which students are asked to analyze & develop models. **Target for Success:** At least 70% of the questions are answered correctly	**Program Review Reporting Year:** 2014-2015 **Target :** Target Met Out of 32 students taking exams 1-3, 11 students performed well (earning at least 90%) on 4-5 problems, 8 students performed well on 3 of 5 problems, 6 students performed well on 2 of 5 problems, and 7 students performed well on 0-1 of the 5 problems. (12/25/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** More emphasis needs to be placed on (i) using exponential & logarithmic functions to solve equations; (ii)	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		transformations of parent functions; (iii) using sign analysis to sketch the graphs of polynomial & rational functions.	
MATH241_SLO_2 - Communicate concepts and solutions for problems both verbally and in writing. **SLO Status:** Active	**Exam - Course Test/Quiz -** Look at student performance on three application problems on the final	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Out of 42 students taking the final exam, 14 students performed well (earning at least 90%) on all 3 problems, 12 students performed well on 2 of 3 problems, 8 students performed well on 1 of 3 problems, and 8 students performed well on 0 of 3 problems. (02/14/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** More emphasis needs to be placed on dissecting an application problem and (i) converting the information into mathematical expressions; (ii) understanding which mathematical formulas & procedures to use.	**Enhancement:** Include many more opportunities for students to work in groups, dissecting an application problem and working towards solving it. Then, give time in which the instructor elicits responses and discusses multiple ways of interpreting and solving the problem. (02/14/2013)
	Exam - Course Test/Quiz - Used 2 problems - one involving a linear relationship & the other a logarithmic - to assess. Students were given a situation and asked what type of relationship there was between the variables & why; then, they used data to create a function & evaluated various values using the function. **Target for Success:** High proficiency (>= 90%) for at least 70% of the class	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met 70% scored >=90% 10% scored 80-90% 5% scored 70-80% 15% scored <70% (01/24/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students were able to identify & explain the differences between linear & logarithmic relationships reasonably well. They also did a good job computing the various values correctly, especially with the linear equations. The most recurring issues were explanations of the differences & using the exponential function in a logarithmic equation to solve for unknowns.	
	Exam - Course Test/Quiz - 3 application problems on exams 1-3 **Target for Success:** At least 70% of problems answered correctly	**Program Review Reporting Year:** 2014-2015 **Target :** Target Met 50% scored >= 90% 20% scored 80-90% 10% scored 70-80% 20% scored <70% (12/25/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students were proficient in explaining differences among linear, exponential, & logarithmic relationships; however, more emphasis needs to be placed on dissecting an application problem & converting it into mathematical expressions & equations	

MATH 242:Academic Excellence in Trigonometry

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MATH242_SLO_1 - Analyze and develop trigonometric models. **SLO Status:** Active **Planned Assessment Quarters:** 2012-13 3-Winter	**Exam - Course Test/Quiz -** A final exam question involving a ferris wheel in which students are asked to create a trigonometric function modeling the height of an individual on the wheel, finding characteristics such as height, max, min, frequency, and period.	**Program Review Reporting Year:** 2015-2016 **Target :** Target Met 28 of the 40 students earned 75% to full credit on the problem; 5 students earned 50-75% credit on the problem; 7 students earned less than 50% credit on the problem (10/14/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** A number of students had an issue translating information about a circular ferris wheel to the graph of a sine / cosine function	**Enhancement:** I will show an applet of points on the unit circle corresponding to points on a sine / cosine / tangent graph (10/14/2016)
		Program Review Reporting Year: 2012-2013 **Target :** Target Met 25 students met the objective at a high level of proficiency (earning at least 90% on the problem). 8 students met a satisfactory level of proficiency (earning 70-90% on the problem). 7 students had an unsatisfactory level of proficiency (earning below 70% on the problem). (06/26/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Many students did well on the question. Among students who did not, issues that occurred were: (1) students misinterpreted the range of heights as the amplitude; (2) students misinterpreted the min height as the vertical shift; (3) students were unable to write the trigonometric model 2 different ways (using sine and then cosine).	
MATH242_SLO_2 - Communicate concepts and solutions for problems both verbally and in writing. **SLO Status:** Active **Planned Assessment Quarters:** 2012-13 3-Winter	**Presentation/Performance -** Students complete application problems, explain their solutions in writing as well as using equations & formulas, and present their solutions to the class	**Program Review Reporting Year:** 2015-2016 **Target :** Target Met Students, in groups of 2-3, presented their solutions to application problems involving trigonometric models. They explained their process, solution, stumbles along the way, and potential misconceptions (10/14/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I will communicate more of the potential misconceptions to groups that solve the problem correctly	
		Program Review Reporting Year: 2012-2013 **Target :** Target Met Students completed various application problems in teams,	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		explained their solution algebraically & in writing, and then presented their findings to the class. Problems included: ferris wheel trigonometric models; bearings of planes involving Law of Cosines & Law of Sines; angle of elevation / depression problems involving right triangle trigonometry (06/26/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students met the target. Some areas of improvement and potential future issues include: (1) developing writing skills for English language learners; (2) Getting students to explain ideas & concepts more than their procedures during presentations.	

MATH 243:Academic Excellence in Precalculus

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MATH243_SLO_1 - Analyze and develop trigonometric, matrix, and discrete models for problems within two- and three- dimensional Cartesian or polar coordinate systems. **SLO Status:** Active	**Presentation/Performance -** Students complete & present the solution to a matrix model problem **Target for Success:** Correct solution & clear & coherent explanation	**Program Review Reporting Year:** 2015-2016 **Target :** Target Met Students worked in groups of 3-4 students & completed matrix model problems & then presented their solutions in front of class. All groups completed problems correctly & explained solution (10/14/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students are proficient at the matrix row operations but have trouble with notation, labeling their row operations	**Enhancement:** I will show examples of notation for each type of row operation to better prepare students (10/14/2016)
		Program Review Reporting Year: 2012-2013 **Target :** Target Met Students worked in groups of 3-4 students & completed matrix model problems & then presented their solutions in front of class. All groups completed problems correctly & explained solution (09/22/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students are proficient in (1) setting up system of equations; (2) finding solution using matrix operations. Students have difficulty representing solutions to systems of linear equations graphically and differentiating among solutions that are represented graphically as a point, line, plane, or 3-space.	
	Presentation/Performance - Students complete & present the solution to a linear system & matrix application problem to the class. **Target for Success:** Correct solution. Understandable & clear presentation	**Program Review Reporting Year:** 2015-2016 **Target :** Target Met Students worked in groups of 2-4 & completed a linear system & matrix application problem & then presented their solutions in front of the class. All groups completed problems corrected & 1-2 students per group presented solution & answered questions from the class & myself. (10/14/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students had the most difficulty explaining and visualizing the graphical difference among 0, 1, and infinitely many solutions	**Enhancement:** I will show an applet displaying the graphical difference among 0, 1, and infinitely many solutions (10/14/2016)
		Program Review Reporting Year: 2013-2014 **Target :** Target Met Students worked in groups of 2-4 & completed a linear system & matrix application problem & then presented their solutions in front of the class. All groups completed	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		problems corrected & 1-2 students per group presented solution & answered questions from the class & myself. (12/24/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students correctly set up systems of equations, found the solution using matrix operations & checked their solution using a calculator. Students have difficulty explaining the difference graphically among no, one, and infinite solutions.	
MATH243_SLO_2 - Communicate concepts and solutions for problems both verbally and in writing. **SLO Status:** Active	**Presentation/Performance -** Students complete & present solutions to the practice final exam problems. **Target for Success:** Correct solutions & clear & coherent explanations	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Students worked in groups of 3-4 students & completed matrix model problems & then presented their solutions in front of class. All groups completed problems correctly & explained solution (09/22/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students were success presenting expressing their solutions in writing, describing each of the main steps in writing. However, a number of students, notably international students, still struggle with expressing their mathematical ideas orally in front of class.	
	Presentation/Performance - Students complete & present the solution to a linear system & matrix application problem to the class. **Target for Success:** Correct solution. Understandable & clear presentation	**Program Review Reporting Year:** 2015-2016 **Target :** Target Met Students worked in groups of 2-4 & completed a linear system & matrix application problem & then presented their solutions in front of the class. All groups completed problems corrected & 1-2 students per group presented solution & answered questions from the class & myself. (12/24/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students were proficient in explaining the algebraic operations needed to complete the problem. However, a number of students still have difficulty expressing multiple representations (i.e. graphical representation of infinite solutions to system of equations)	

MATH 2A:Differential Equations

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MATH2A_SLO_1 - Construct and evaluate differential equation models to solve application problems. **SLO Status:** Active **Planned Assessment Quarters:** 2012-13 2-Fall **Outcome Creation Date:** 09/24/2012	**Exam - Course Test/Quiz -** The students will be assessed in course through Tests , quizzes, and Projects. **Target for Success:** The students should be able to complete each task at a level of 60% and above for success.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met MATH-2A_SLO_1 has been assessed on Test 2. The distribution of grades is the following: >=90%---4 students; >=80%---13; >=70%----16 students; >=60%---5 students; <60%----0 student. (07/31/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** MATH_2A_SLO_1 is difficult for students who take an introductory differential equations course. A construction of models for phenomena from different field of science require acquaintance with some Laws pertained to a subject matter. So some students need to comprehend these laws in conjunction with learning theory on solving differential equations.	**Enhancement:** The main difficulty experienced by the students when they have been assessed on SLO 1 is a construction of the corresponding differential equation model, i.e. to transform the word description of the process into the corresponding initil value problem. I plan to develop a handout dealing with this issue. Namely, it will contain 4 type of problems, which require to transform the physical experiment into the initial value problem for 1st or 2nd order differential equation. (09/30/2013)
		Program Review Reporting Year: 2012-2013 **Target :** Target Met MATH2A_SLO_1 has been assessed mainly on Test 2. The distribution of grades on Test 2 is the following : >=90%---5 students; >=80%---13; >=70%----7 students; >=60%---13students; <60%----0 student. (07/31/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The results on the assessment of MATH_2A_SLO_1 are lower comparing with the results on the assessment of MATH-2A_SLO2. This can be explained that a construction and evaluating models using Differential Equations is much more complicated task, comparing with more formal MATH-2A_SLO-2, where the differential equation is given in advance and a student needs just to choose an appropriate technique. Setting up a model requires sometimes to knoe specific laws from the corresponding branch of science (physics, chemistry, biology, etc.). This contributes to the difficulties, experienced by students performimg this task.	**Enhancement:** The main difficulty experienced by the students on SLO 1 is the transformation of the word description of the physical experiment into the corresponding initial value problem for the appropriate differential equation. The special handout will be developed to help students to learn this type of translation, including the initial value problems for 1 st and 2nd order differential equations. (09/30/2013)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		Program Review Reporting Year: 2012-2013 **Target :** Target Met The students who completed the course, met the required and stated target for success with more than 50% attaining a Level of success of more than 80%. (12/20/2012) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Most of the students who dropped or withdrew from the class had difficulties with integration techniques which is essential in solving differential equation problems. Of the students who remained, some of them had difficulties with some of the concepts, and in analyzing differential equations problems, and in applying appropriate solution techniques.	**Enhancement:** The special handout will be developed to help students correctly to transform a word description of a physical experiment into the corresponding initial value problem for 1st or 2nd order differential equation (09/30/2013)
	Exam - Course Test/Quiz - Students skill was assessed through the comprehensive final. **Target for Success:** 70% of the students get 70% or more on the final.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met 29 out of 35 students passed the final. (11/07/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The students did very well in the final that could be due to the time we spent reviewing and practicing the skills.	
	Exam - Course Test/Quiz - Exam two covered the objectives in this SLO. **Target for Success:** 70% of students get a grade of 70 or higher.	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met 27 out of 38 students taking this exam passed. (about 71%) (10/08/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The students did very well in this exam and seemed to understand the material for this exam although there is definitely room for improvement.	**Enhancement:** I will be incorporating more application problems for future quarters. (10/08/2017)
MATH2A_SLO_2 - Classify, solve and analyze differential equation problems by applying appropriate techniques and theory. **SLO Status:** Active **Planned Assessment Quarters:** 2012-13 2-Fall **Outcome Creation Date:** 09/24/2012	**Exam - Course Test/Quiz -** The students will be assessed in course through tests , quizzes, and a comprehensive final exam. **Target for Success:** The students should be able to complete each task at a level of 60% and above for success.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Not Met MATH_2A_SLO_2 has been assessed through Test 1 and Test 3 of the course. The distributions of grades are the following: Test 1:>=90%---16 students; >=80%---11; >=70%----4 students; >=60%---4 students; <60%----4 student. Test 3: >=90%---28 students; >=80%---0; >=70%----2 students; >=60%---2 students; <60%----0 student.The target has been met on Test 3, but not on Test 1. (07/31/2013)	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		Reflection (CLICK ON ? FOR INSTRUCTIONS): The fact that 4 students failed Test 1 is a confirmation that some students registered for the class actually are not prepared for the sophistication of the concepts and the methods developed and employed in the class. Those who "survived" Test 1 are successful in the course under normal circumstances. The results of Test 3 show that the students who did not withdraw form the class are very successful in comprehension of the course material.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Met SLO2 for MATH-2A class has been done through Test 1 and Test 3. The distribution of grades is the following. Test 1: >=90%---15 students; >=80%---11; >=70%----1 students; >=60%---1 students; <60%----0 student. Test 3: >=90%---16 students; >=80%---10; >=70%----1 students; >=60%---1 students; <60%----0 student. (07/31/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** SLO2 of the course is more formal than SLO1. It requires to learn the classification of differential equations, learn the corresponding techniques to solve them and decide which method should be applied for a particular differential equations.Most of the students were highly successful in performing this task as we can conclude from the results on Test 1 and Test 3.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Met The students who completed the course, met the required and stated target for success with more than 50% attaining a level of success of more than 80%. (04/02/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Most of the students who dropped or withdrew from the class had difficulties with integration techniques which is essential in solving differential equation problems. Of the students who remained, some of them had difficulties with some of the concepts, and in analyzing differential equations problems, and in applying appropriate solution techniques.	
		Program Review Reporting Year: 2012-2013	**Enhancement:** Students were

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
		Target : Target Met The students who completed the course, met the required and stated target for success with more than 50% attaining a Level of success of more than 80%. (12/20/2012) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Most of the students who dropped or withdrew from the class had difficulties with integration techniques which is essential in solving differential equation problems. Of the students who remained, some of them had difficulties with some of the concepts, and in analyzing differential equations problems, and in applying appropriate solution techniques.	given extensive integral tables. Problems were classified to enable the students to easily identify the appropriate and applicable solution techniques. Projects, with step by step guidance, were given to enhance the students ability to analyze and solve different types of differential equations. (12/20/2012)
		Program Review Reporting Year: 2012-2013 **Target :** Target Met For this assessment I use the final test score. The final had questions addressing each and every portion of this SLO. Target is that 80% of students will get 70% or higher. (12/11/2012) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 86% of students did very well in the final. That could be because of the fact that we spent a lot of time reviewing the techniques and after a quarter they knew how to approach most of the problems. Still 14% did not do as hoped. That could be due to the time elapsed since we covered some of the earlier techniques and models. Maybe next time we will have a review of the earlier techniques to solve that issue. Overall the results exceed expectation.	
	Exam - Course Test/Quiz - A comprehensive written final was used. **Target for Success:** 70% of students get 70% or more on the final.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met 29 out of 35 students did very well on the final and passed. (11/07/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Almost half of the test revolved on this skill and students did very well. That could also be because of the extended time spent in practicing these skills.	
	Exam - Course Test/Quiz - Our comprehensive final covered the objectives in this SLO.	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met 30 out of 36 students who took the exam passed with a	**Enhancement:** Although the results were good I feel I will add more applications in the class.

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	Target for Success: 70% of students get a grade of 70 or higher.	grade of 70 or higher (83%). (10/08/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The result was much better than expected but that could be because the special focus on these objectives this quarter.	(10/08/2017)

MATH 2B:Linear Algebra

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
MATH2B_SLO_1 - Construct and evaluate linear systems/models to solve application problems. **SLO Status:** Active	**Exam - Course Test/Quiz -** A quiz question in which the students solve a network, RLC circuit) problem using Ohms law, Kirchkhoff's Voltage and current laws and linear system of equations to find the value of the current in different parts of the circuit (network). **Target for Success:** The student set up a system of linear equations in an unknown quantity, then use an elimination method to solve for the unknowns.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met 27/29 students completed this topic correctly on an exam (01/06/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** More applications could be used, though students are understanding what is presented.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Met 23 out of 36 students had perfect success setting up the equations and finding the correct values for the current, 10 students have set up the equations with minor errors in coefficients, and three students had difficulty setting up the system of equations. (06/06/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Spend more time preparing students back ground knowledge on RLC circuits using hand outs and reading references. The alternative is to have the students work a network problem that involves traffic flow as this type of problem does not require basic knowledge in in science and engineering.	**Enhancement:** Proved students with a handout on Ohm's law and Kirchhoff''s voltage and current laws and reference material on these topics. (06/06/2013)
	Project - For their first homework students had to set up a system to find an equation for a circle passing through three points. **Target for Success:** 70% of students setting a system of linear equations to find the coefficients.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met 29 out of 41 students who turned in their homework set the system up correctly and those who set up the system correctly were able to solve the system since the solving process is at a precalculus level. The students who did not complete the problem correctly had misread the problem or were not sure about what was asked from them. (09/23/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** In order to improve the results I would next time explain the problem verbally for the students before and assigning the homework.	
	Exam - Course Test/Quiz - The students were given a final exam in which they had to solve an application problem (problem #4).	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met 36 students took an exam question asking them to use techniques of linear algebra to fit a parabola to specified	**Enhancement:** The next time I teach the course I plan to allocate more time to applications. (12/21/2017)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	Target for Success: 70% students get answer the question correctly.	points. The average score was 89%. (12/21/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** It was suggested (and I agreed) that I could rearrange the course to spend more time on applications, possibly including a project.	
		Program Review Reporting Year: 2016-2017 **Target :** Target Met Out of the 36 students taking the final 28 of them answered the question correctly. (77%) (10/08/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The student did well. The application problem was from one of the more recent topics and students had practiced similar problems in the days before in class.	**Enhancement:** I would take similar approach to this topic for other applications as well to get similar results. (10/08/2017)
MATH2B_SLO_2 - Solve problems by deciding upon and applying appropriate algorithms/concepts from linear algebra. **SLO Status:** Active	**Exam - Course Test/Quiz -** Test questions in which the students solve a linear system of equations that have unique solutions, infinite number of solution and no solutions. The solution involves using matrices and Gaussian Elimination and reading the solution to the system from the reduced system or parametrize the solution in the infinitely many solutions case. **Target for Success:** The student use Gaussian Elimination to solve linear systems.	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met 33 students answered a test question as described above and scored an average of 82%. (12/21/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Material could have emphasized computational issues more.	**Enhancement:** Writing handouts giving additional material and tips on Gaussian elimination. (12/21/2017)
		Program Review Reporting Year: 2013-2014 **Target :** Target Met 24 out of 28 students completed a question on the final exam correctly. (01/06/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** More work can be done on picking the most effective method	
		Program Review Reporting Year: 2012-2013 **Target :** Target Met The 36 students that answered questions that cover SLO_2 had an overall average of approximately 86%. Some students made errors in the elimination method that requires pencil paper computations, others made mistakes in the problem that requires writing a parametric solution. (06/06/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Make sure that students can identify free variables in the reduced system and understanding the rule of leading ones or pivots. The concept was simple enough that most students were able to write complete and correct solutions.	**Enhancement:** Have students work out problems that are graded and returned to students before testing or assign computer laps that are graded and and reviewed by students immediately upon completion. (06/06/2013)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	Exam - Course Test/Quiz - Exam 1 was made up of several problems that required linear algebra methods in solving. **Target for Success:** 70% of students get a passing score of 70 or higher.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met 38 students out of 46 who participated in test one received a grade of 70 or higher which is 82%. (09/23/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students performed very well in this test which could mean they understood the concept well. However students who missed the mark did because of calculation errors and some were not able to relate linear algebra to the problems. Next time I will be doing sample problems to show students methods of approaching problems with the theory of linear algebra.	
	Exam - Course Test/Quiz - Our second test was based on this SLO. **Target for Success:** 70% of students get a grade of 70 or above.	**Program Review Reporting Year:** 2016-2017 **Target :** Target Not Met Out of 36 students who took the test 24 of them received a passing score. (66%) (10/08/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The students did not do as well as I felt they should have but that could be because the level of difficulty of the material and the little time between covering the martial and the exam. They did much better by the final.	**Enhancement:** I think using an appropriate worksheet would help with this topic and increase the success. (10/08/2017)
MATH2B_SLO_3 - Apply theoretical principles of linear algebra to define properties of linear transformations, matrices and vector spaces. **SLO Status:** Active	**Exam - Course Test/Quiz -** The students solve problems on tests, quizzes and homework in which they demonstrate their understanding of linear transformations, their corresponding matrices and and actions applied to vector spaces. **Target for Success:** The students achieve 60% or higher on tests quizzes and homework assignmets..	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met 36 students did an exam question on the relation between linear transformations and matrices. The average score was 11.3/12 (94%). (12/21/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I think it was effective relating linear transformations as geometric transformations on R^n.	**Enhancement:** Use of graphing software could be used to create illustrations to further illustrate this material. (12/21/2017)
		Program Review Reporting Year: 2013-2014 **Target :** Target Met 20 out of 28 students completed a question on the final exam correctly (01/06/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** More work should be done on creating the matrix representation of a transform and on finding the kernel and inverse of the transformation	
		Program Review Reporting Year: 2012-2013 **Target :** Target Met	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		Approximately 75% of the students who took the final exam scored 100% in defining and applying linear transformations, the other 25% had partial success on at leas one of the problems. (07/01/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** none	
	Exam - Course Test/Quiz - Test two was all problems involving applying principles of linear algebra to linear transformations and vector spaces (chapter 4 or Anton). **Target for Success:** 70% of students get a passing score of 70 or higher.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met 31 students out of 44 who participated in test 2 received a grade of 70 or higher. (09/23/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The target was just barely met. Looking back maybe the time spent was not as much as some of the students needed in understanding the relatively abstract concept of vector spaces. Next time I will spend more time with examples to clarify the topic more.	
	Exam - Course Test/Quiz - Our third exam covered this SLO. **Target for Success:** 70% of students getting a grade of 70 or higher.	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met out of 31 student 21 students passed the test (68%) (10/08/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The class almost met the target. I think the numbers don't do justice to the performance. The students picked up the concept very well but I feel we could've spent more time on the topics.	**Enhancement:** Like other SLO's I am planning on using more worksheets for the class. (10/08/2017)

MATH 41:Precalculus I: Theory of Functions

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
MATH41_SLO_1 - Investigate, evaluate, and differentiate between algebraic and transcendental functions in their graphic, formulaic, and tabular representations. **SLO Status:** Active **Planned Assessment Quarters:** 2012-13 2-Fall	**Exam - Course Test/Quiz -** Look at student performance on four MT #3 problems, in which students were asked to evaluate, graph, and transform algebraic & transcendental functions. **Target for Success:** 70% of students will achieve a C or better.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Out of 42 students taking MT #3, 11 students performed well (earning at least 90%) on all 4 problems, 8 students performed well on 3 of 4 problems, 9 students performed well on 2 of 4 problems, 7 students performed well on 1 of 4 problems, and 7 students performed well on 0 of 4 problems. (02/14/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** More emphasis needs to be placed on (i) algebraic manipulation, (ii) multiple representations of a function, especially graphical interpretation; (iii) transformations of parent functions; (iv) characteristics of parent functions, such as domain, range, intercepts, & symmetry.	**Enhancement:** I will allocate more time in class toward having students graph transformations of functions, labeling all of the key aspects of the graph and describing the effects on each from the transformations. I will also administer the same types of problems the next time I teach math 41 and track the progress made. (02/14/2013)
	Exam - Course Test/Quiz - Graph the given functions by hand. Functions are exponential and log function with transformations. Students were graded for completion and accuracy in graph creation. **Target for Success:** There were 12 points possible on the problem given. Our target would be 70% or higher in points obtained per student. **Comments/Notes:** The average points obtained per student was 6.5/12 or 54%. This is below what we have hoped for. We feel we need to do a better job on either teaching or reviewing graphing functions and applying transformations before giving test. **Related Documents:** Math41-W13.xls	**Program Review Reporting Year:** 2016-2017 **Target :** Target Not Met 60% of students achieved 75% of questions correctly (01/25/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The students who did not well had done less than 60% of the assigned homework and in most casese none of the three extra-credit homework assignments.	**Enhancement:** Increase the weight of the homework toward the final grade from 10% to 15%. (01/25/2017)
		Program Review Reporting Year: 2013-2014 **Target :** Target Not Met 65% scored >=90% 10% scored 80-90% 10% scored 70-80% 15% scored <70% (01/24/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** PROS: Students did a very good job explaining the transformation in words, using terminology like phase shift, stretch, shrink / compress, & reflect well. They also did a good job transforming the coordinate points from the parent to transformed function. CONS: Students have difficulty transforming when there are 2-3 transformations with the input variable.	
	Exam - Course Test/Quiz - Used		

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	formulaic representations of transformations of 2 functions - a logarithmic & an exponential - and had students, on an exam, describe the transformations (1) in words; (2) based on how the points are transformed; (3) based on how the graph is transformed. Students were required describe all 3 and then sketch the graph of the transformed functions **Target for Success:** There were a total of 20 points possible for the 2 questions. The target was high proficiency (>=90%) on 70% of the exams.		
	Exam - Course Test/Quiz - Use problem from #3 from Final Exam which requires student to graph a rational function showing all steps. 3. Consider the rational function: f(x)= (x^2 - x - 2)/(x^2 - 5x + 6) (a) Factor the top & bottom & write f(x)in factored form (b) Find the domain of f(x) . Determine if f(x) has any vertical asymptotes and/or holes and where these would be. (c) If f(x) has any common factors to cancel, cancel them and write f(x)in reduced form. You can use the reduced form for the rest of the problem. If has no common factors to cancel, proceed with the original . (d) Find the x-intercept(s) (if any). (e) Find the y-intercept (if it	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met After totaling the scores for this problem on the final exam, the average score was 12.2 out of 15 for an average percent of 81.39%. This well exceeds my target of success. (04/15/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I am pleased with the results. But, I will continue to work on expanding techniques of graphing when teaching **Related Documents:** SLO Data W14.xls	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	exists). (f) Find the equation of any horizontal asymptote for . (g) Sketch the graph of f(x)by testing points on either side of each vertical asymptote. **Target for Success:** The total points for this problem is 15, so I am hoping that students get 70% or higher (10 points or higher).		
	Exam - Course Test/Quiz - In the Midterm and Final Exam students were asked to recognize, analyse and graph the given functions by hand. Functions are rational, exponential and logarithmic function with transformations. Students were graded for completion and accuracy of the graph. **Target for Success:** Expect more than75% of the students to sketch the graph nearer to accuracy and >=10% of the students to be able to at least get the shape of the graph.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met More than 72% of the students were able to graph the functions closer to accuracy. About 16% could identify the nature of the function and get closer to the shape of the curve. 15% made mistakes in finding the zeros and identifying the asymptotes of rational function. (06/25/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Most of the students who failed in graphing rational functions started out without simplifying the given function and in finding the zeros by factoring. A handfull of students did not understand the nature of asymtotes. Around 10% of the students did not get the correct transformations from the standard functions.	
	Exam - Course Test/Quiz - On the second midterm of the quarter, students are asked to analyze the function g(x)=3(x-1)^2 +2. The analyzation process requires students to identify the parent function f(x), to describe the	**Program Review Reporting Year:** 2015-2016 **Target :** Target Met Of the 80 students who took this exam, 62 were able to earn at least 8 points on this problem. This accounts for 77.5% of the entire class. (06/11/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** It seems that some students were struggling with finding the domain and	**Enhancement:** Having graphing calculators (TI-83 or TI-84) would be helpful for students who want to graph the functions using technology to further understand analyzation. (10/18/2016)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	transformation from f(x) to g(x) (or vice versa), to determine the domain and range of g(x), and to determine the domain and the range of it's inverse function g^-1(x). **Target for Success:** Our target is that 70% of all students are successful on this problem. They are considered successful if they are able to answer 80% of it. This means that they are able to earn 8 of the 10 possible points. There is little to no work to be graded as either the answer is right or wrong.	the range of the inverse function of g. In the future, it may be a good idea to emphasize the relationship between the original function and its inverse function and how the domain of g is the range of the inverse of g. Similarly, it would be helpful to graph both functions on the exam so that the students can clearly see the picture.	
	Exam - Course Test/Quiz - On an exam, students are asked to analyze the function g(x)=9(x-2)^2 +3. The analyzation process requires students to identify the parent function f(x), to describe the transformation from f(x) to g(x) (or vice versa), to determine the domain and range of g(x), and to determine the domain and the range of it's inverse function g^-1(x). **Target for Success:** Our target is that 70% of all students are successful on this problem. They are considered successful if they are able to answer 80% of it. This means that they are able to earn 8 of the 10 possible points.	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met Of the 76 students who took this exam, 59 were able to earn at least 8 points on this problem. This accounts for 77.6% of the entire class. (10/24/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** It would be helpful to graph both functions on the exam so that the students can clearly see the picture. Although I've tried this assessment method in another quarter without the graph, I thought it would be a good idea to do so again to see if students would graph the functions for themselves to analyze them. It would be a good idea in the future to have the graphs provided.	**Enhancement:** Having graphing calculators (TI-83 or TI-84) would be helpful for students who want to graph the functions using technology to further understand analyzation. (10/24/2017)
	Exam - Course Test/Quiz - I used a problem from Final Exam which required students to graph a rational function by showing all steps. Consider the rational function: f(x) = (x^2 - x - 2)/(x - 1) (a) Find the domain of f(x) .		

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	(b) Identify all intercept(s). (c) Determine if f(x) has any vertical asymptotes and/or holes. (d) Find any slant or horizontal asymptotes (e) Plot additional solution points as needed to graph the function. **Target for Success:** This problem is worth 8 points. Target for success is at least 70% or higher (5.6 points or higher per student). **Comments/Notes:** The average points obtained per student was 5.7/8 or 71%. This is above the target success. **Exam - Course Test/Quiz -** Students are tested on the day of learning the material as well as on midterms and the final exam **Target for Success:** 70%		
	Exam - Course Test/Quiz - On the third midterm, students were asked to graph and analyze transformations of transcendental functions by hand. Students were graded for completion and accuracy of the graph. **Target for Success:** The target for success was 70% of students taking the exam.	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met Responses of results were examined. 72% of students who took the exam successfully graphed the base transcendental function. (12/13/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I staged the question first asking students to draw the parent transcendental function (e^x) then asked them to graph the transformation e^-x-4. The initial drawing helped orient the students.	**Enhancement:** I'll use additional transformations next quarter and will continue to provide worksheets that help students master the topic. (12/13/2018)
	Exam - Course Test/Quiz - On the sixth quiz of the quarter, students are asked to consider a rational function. They are required to identify the x- and y-intercepts, find any horizontal and vertical asymptotes, and then sketch the graph (they may choose to use tables or other techniques to sketch	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met Of the 38 students who took the quiz, 28 students completely and correctly answered the question (I did deduct points for minor errors, such as forgetting to put parentheses around coordinate points, but still considered the question to be answered correctly). There were 3 students who almost answered the questions fully correctly, but I deducted points because they did not use open circles	**Enhancement:** I'm not sure if this would be a good idea - but it's something to consider. Perhaps I could remind students on the quiz to find the domain of the rational function first to remind them that it's important not to plot points that do not exist (and to use open circles instead). (01/02/2019)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	the graph). **Target for Success:** At least 70% of the students should answer the question completely and correctly.	for where a point was excluded from the domain of the rational function. (01/02/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I believe that there would have been more than 74% of the students who answered the question completely and correctly if the students had more time during the quiz to check their work. Some of the points that were deducted were due to mistakes that may have been caught if they had a few more minutes.	
	Exam - Course Test/Quiz - Students were asked to sketch the graph of a rational function, finding the x- & y-intercepts, domain, vertical, horizontal, and slant asymptotes. Students were graded on correctness. **Target for Success:** at least 70% completed the problem correctly	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met 80% of students answered the problem correctly (at least 90% credit). (11/01/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Next quarter, I will create a problem with more challenging factoring in the numerator & denominator	
	Exam - Course Test/Quiz - Final exam **Target for Success:** 90% of students score 60% or higher on the exam.	**Program Review Reporting Year:** 2019-2020 **Target :** Target Not Met 19 out of 28 (68%) of students in the MPS class met the target grade, and 23 out of 31 (74%) of students in the MPS class met the target grade. Overall target was not met (01/04/2020) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Additional research and support for students in this course post-AB705 is still needed. As an instructor I will continue to work on writing final exams that are rigorous yet allow students to demonstrate all that they have learned.	**Enhancement:** More must will be done to help our least prepared students succeed in transfer-level math. (01/04/2020)
MATH41_SLO_2 - Synthesize, model, and communicate real-life applications and phenomena using algebraic and transcendental functions. **SLO Status:** Active	**Exam - Course Test/Quiz -** Look at student performance on three application problems on midterm or final **Target for Success:** 70% of students will correctly answer questions.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Out of 42 students taking the final exam, 14 students performed well (earning at least 90%) on all 3 problems, 12 students performed well on 2 of 3 problems, 8 students performed well on 1 of 3 problems, and 8 students performed well on 0 of 3 problems. (02/14/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** More emphasis needs to be placed on dissecting an application problem and (i) converting the information into	**Enhancement:** Include many more opportunities for students to work in groups, dissecting an application problem and working towards solving it. Then, give time in which the instructor elicits responses and discusses multiple ways of interpreting and solving the problem. (02/14/2013)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		mathematical expressions; (ii) understanding which mathematical formulas & procedures to use.	
	Exam - Course Test/Quiz - Problem: "For a saving account in which interest is compounded continuously, derive the tripling time formula in terms of the interest rate r." **Target for Success:** 70% of the possible points correct. **Comments/Notes:** The mean score was 4 out of 10. Students are more comfortable dealing with numbers rather than variables. Which I believe more practice is necessary with problems without numbers. **Related Documents:** Math41-W13-2.xls		
	Exam - Course Test/Quiz - Have 2 questions on the final regarding real-life applications, one algebraic and one transcendental. **Target for Success:** 75% of students will get at least one right.	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met 80% of students achieved 71% of questions correctly (01/25/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The students who did not do well had difficulty interpreting and analyzing word problems.	**Enhancement:** Assign more word problems. (01/25/2017)
		Program Review Reporting Year: 2012-2013 **Target :** Target Met Of the 32 students taking the final, 30 got at least one of the two application questions. In fact 24 (75%) got the algebraic question right, meeting the target right there! (07/25/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I am pleased they did so well, my emphasis on application problems seems to have paid off.	
	Exam - Course Test/Quiz - Used 2 problems - one involving a linear relationship & the other a logarithmic - to assess. Students were given a situation and asked	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met 70% scored >=90% 10% scored 80-90% 5% scored 70-80%	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	what type of relationship there was between the variables & why; then, they used data to create a function & evaluated various values using the function. **Target for Success:** High proficiency (>= 90%) for at least 70% of the class.	15% scored <70% (01/24/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students were able to identify & explain the differences between linear & logarithmic relationships reasonably well. They also did a good job computing the various values correctly. The most recurring issues were explanations of the differences & using the exponential function in a logarithmic equation to solve for unknowns.	
	Exam - Course Test/Quiz - Use problem #2 on Final Exam which requires student to create & use a real-life model. 2. Suppose the population of the world is known to be growing exponentially. In 2000, the population was 6.08 billion and in 2010, had risen to 6.85 billion. (a) Find a model , that would give the population of the world, in billions, for years since 2000. (b) After how many years will the population reach 50 billion (the theoretical capacity of the Earth)? What year will this be? **Target for Success:** The question is worth 12 points altogether. I am hoping that students score 70% of the possible points or higher (8 points or higher).	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met After tallying the scores for problem #2 from the final exam, the average score was 9.83 out of 12 for an average percentage of 81.94%. (04/15/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Target was met. I think the problem went well. Was very pleased. **Related Documents:** SLO Data W14.xls	
	Exam - Course Test/Quiz - Two questions are given in the final exam, to find a suitable mathematical model to represent the real-life problems, showing the relationship between the variables and evaluating the unknown. The first one is to build a model to determine the interest earned through an investment compounded	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met 78 students (2 sections) took the final exam covering these two types of real-life problems. 77% of the student got at least one of the two questions completely correct. Among the other students most of them wrote the models correct but made mistakes in solving the exponential equation. (06/27/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Overall the understanding of the real-life application of function was	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	annually vs. compounded continuously. The second is to build an exponential growth/decay model to solve a radio-active decay problem. **Target for Success:** Expected to have more than 80% of the class to succeed in building the right model for at least one of the 2 problems. 70% to solve completely these real-life problem completely.	good.	
	Exam - Course Test/Quiz - Students are asked to answer the following question on a midterm exam during the Winter 2016 quarter: The sales for Apple, Inc. in 2004 were approximately $8.28 billion. In 2010, the sales were approximately $65.23 billion. Find the equation of the line that would represent the sales of Apple, Inc. If necessary, round the slope to the nearest two decimal places. Using the equation from part a, predict the sales for 2016. Then briefly explain why this prediction is an example of interpolation or extrapolation. **Target for Success:** 70% of all students are successful on this problem if they are able to answer 80% of it. This means that they are able to earn 4 of the 5 possible points. The first part is worth 3 points and the second part is worth 2 points (explanation of whether the example is an interpolation or an extrapolation).	**Program Review Reporting Year:** 2015-2016 **Target :** Target Met Of the 80 students who took the exam, 67 were able to answer the question fully, earning either 4 or 5 of the total of 5 points on the problem. Since 67 of 80 (approximately 84%) students were successful on this problem, the target has been met. (05/05/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students were able to model real-life applications using mathematical equations. The translation portion from words to math tends to be a more difficult part of math for some students, but it seems that with doing lots of practice problems prior to the exam day, the students were successful.	**Enhancement:** It would be nice to have all students have access to a graphing calculator (TI-83 or TI-84) so that the data points could be plotted and viewed easily. This would further emphasize the idea of interpolation or extrapolation. (10/18/2016)
	Exam - Course Test/Quiz - Students are asked to answer the following	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met	**Enhancement:** It would be nice to have all students have access to a

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	question on a midterm exam during the Spring 2017 quarter: The sales for Target in 2004 were approximately $8.28 billion. In 2010, the sales were approximately $65.23 billion. Find the equation of the line that would represent the sales of Target. If necessary, round the slope to the nearest two decimal places. Using the equation from part a, predict the sales for 2016. Then briefly explain why this prediction is an example of interpolation or extrapolation. **Target for Success:** 70% of all students are successful on this problem if they are able to answer 80% of it. This means that they are able to earn 4 of the 5 possible points. The first part is worth 3 points and the second part is worth 2 points (explanation of whether the example is an interpolation or an extrapolation).	Of the 76 students who took the exam, 67 were able to answer the question fully, earning either 4 or 5 of the total of 5 points on the problem. Since 67 of 76 (approximately 88.1%) students were successful on this problem, the target has been met. (10/24/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students were able to model real-life applications using mathematical equations. It was also great that immediately following the return of the exams, I was able to use desmos to demonstrate the idea of interpolating and extrapolating data.	graphing calculator (TI-83 or TI-84) so that the data points could be plotted and viewed easily. This would further emphasize the idea of interpolation or extrapolation. (10/24/2017)
	Exam - Course Test/Quiz - I used two problems from Final Exam #22 and #23. (#22) Compound interest problem. A total of $12,000 is invested at an annual interest rate of 9%. Find the balance after 5 yeas if it is compounded monthly and semiannually. (#23) A sculpture has hyperbolic cross section, figure is given. Write an equation that models the curved sides of the sculpture. **Target for Success:** Problem 22 is worth 4 points and problem 23 is worth 4 points. Total 8 points.		

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	Target for success is at least 70% or higher (5.6 points or higher per students). **Exam - Course Test/Quiz -** homework completion and similar questions on midterms and the final exam **Target for Success:** 70%		
	Exam - Course Test/Quiz - Students are tested (on an exam) on an application problem regarding exponential growth. They are required to identify that it is an exponential growth problem (as opposed to exponential decay, logarithmic, or logistic). They are also required to find the model that represents the problem, and then answer a question about the problem using the model that they found. **Target for Success:** We would like to see at least 70% of the problem completed. This means that the students are able to identify the model, find the model (even if some of the numbers are off), and then answer the question using the model.	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met Of the 38 students who took the final exam, 35 answered the question (3 did not attempt the problem). Of the 35 students who attempted the problem, 27 students completed at least 70% of the problem, meaning that they were able to identify the model, find the model, and then answer the question using the model. The other 8 students did not correctly identify the model (exponential growth). This means that 27/35 students were successful in answering the question, which accounts for about 77% of the students who attempted the problem. (12/12/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** This was a good question to determine if students can apply exponential functions to answering real-life applications. I felt that the students were given enough time to attempt the problem, even though 3 students did not try the problem at all. I believe that the problem was written clearly, although it may have been helpful to have various parts, prompting students to first identify the model in part a, write the model in part b, and then answer the question in part c, though some may argue that students need to be able to go through this work on their own to truly test their understanding. Perhaps the step-by-step approach should have been clearly explained in class first.	**Enhancement:** After grading the exam, it's helpful to show the students all of the solutions so that if there were any mistakes or any confusion, this could be cleared immediately. As stated in the reflection, I would rewrite the problem to have 3 parts to be very clear on what is expected from the students in their solutions. (12/13/2018)
	Exam - Course Test/Quiz - Students were asked to synthesize, interpret, and solve a real-life exponential function application using logarithms. **Target for Success:** At least 70% of students complete the problem	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met 75% of students answered the problem correctly (at least 90% credit) (11/01/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Next quarter, I will choose a more challenging application, one where students must create the exponential function as well as	

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
	correctly	solve using logarithms	

MATH 42:Precalculus II: Trigonometric Functions

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MATH42_SLO_1 - Formulate, construct, and evaluate trigonometric models to analyze periodic phenomena, identities, and geometric applications. **SLO Status:** Active	**Exam - Course Test/Quiz -** Used a Law of Sines problem from the final exam to assess student's ability to formulate and evaluate trigonometric models of a geometric application. Student was required to use the Law of Sines twice in the problem in order to get the correct solution. Problem was not seen by students previously in course. **Target for Success:** For the average percentage of the problem done correctly students to be at or above 75%. **Comments/Notes:** P	**Program Review Reporting Year:** 2016-2017 **Target :** Target Not Met Data was collected for two classes. Average score for class #1 was 57.86% and for class #2 it was 67.68%. So, both classes fell short of target of 70%. Interestingly, one class had a significantly higher score than the other. The combined score for both classes was 62.77%. (04/16/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Well, the results were disappointing although one class did almost meet the target of 70%. Both classes were taught the same methods and given the same assignments. As mentioned earlier, the problem used for assessment is a difficult problem, if not the most difficult problem, the students encountered during the quarter requiring many taught skills. In the future, I will continue to teach the material the same way, but might assign more problems for practice. **Related Documents:** SLO Data W17.xls	
		Program Review Reporting Year: 2012-2013 **Target :** Target Met As in the fall, each student's answer was reviewed and assigned a point score from 1 to 10 in completing the problem. The average student score was 9.114, which translates to a 91.14% correct per student per problem. This more than exceeded the target of success of 75% and was significantly higher that the average student score of 79% for the fall. (04/19/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I am very pleased with the results and frankly, was not expecting them. This quarter, I did a little more to teach the concepts of the law of Sines such as giving an in class handout. However, I think overall, the main reason why the average score was higher was the make-up of students in this class as opposed to the fall. The students, overall, were higher achieveing in all aspects of the class. **Related Documents:** SLO Data W-S 13.xls	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		Program Review Reporting Year: 2012-2013 **Target :** Target Met The average percentage of the problem done correctly by students was 79.73%, meaning on average, students completed 79.73% of the problem correctly. This is on target and represents a passing score on this problem (grade of C+) (01/30/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Overall, I was satisfied with the results, especially since the students had not seen a problem quite like that one on any previous homework, quiz or test (I got & used a problem from a different text after seeing it and liking it). For the most part, students either got the entire problem correctly or missed it almost completely...not much in between. **Related Documents:** Math 42 SLOAC Data.xlsx Problem.doc	**Enhancement:** Performed the exact same action as in January. Gave the same problem on final exam as in Fall quarter. Again, students did not know ahead of time the problem they were going to be given and final exam questions from the fall were not given out. Average student score for Winter quarter was 91.14%, significantly higher that in the fall. (04/19/2013) **Enhancement:** Hope to re administer the same type of problem and assessment at the end of the Winter 2013 quarter and compare outcomes. (04/15/2013)
	Other - A mid course review will be given that summarizes the topics to that point. Topics will include solving right triangles, solving trigonometric equations, trigonometric applications and inverse trigonometric functions. **Target for Success:** 70% of the students assessed will achieve 70% or better on the assessment	**Program Review Reporting Year:** 2014-2015 **Target :** Target Met Test T/F answers are assigned one point. Written qustions 10 points each. The average student score was 29.8, which translates to a 74.9% passing rate. This more than exceeded the target of success of 70%. (01/22/2015) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Trigonometry, unlike the other courses in the 41-42-43 series where some topics are repeated, presents new and totally unfamiliar concepts to the student.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Met 15/20 achieved 70% or better on this assessment. (07/02/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students still have trouble evaluating composition of inverse trigonometric functions and trigonometric functions. More practice on relating the ranges of the inverse trigonometric functions is needed.	
	Exam - Course Test/Quiz - The students are asked to solve an	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	application problem in which time and distance are involved. To write a complete solution, the students have to define variables and use definition of bearing, represent the problem geometrically then use trigonometric relations between lines and angles and use proper units to be able to compute distance and time values asked for in the problem. **Target for Success:** The student to be able to set up tools such as definition of variables, use of geometric models and figures, and find trigonometric relationships between these variables, then respond to the question asked for in the problem in a complete sentence(s). **Comments/Notes:** About 2/3 of the students were able to set up the problem completely and show understanding of the process explained in class and the text book. About half the students have correct answers.	About 2/3 of the students were able to set up the problem completely and show understanding of the process explained in class and the text book. About half the students have correct answers. (04/25/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Improve in helping students that lack problem solving skills by adding sets of problems at different levels of difficulties of the type in the assessment and encourage them to finish their assignment on time by working together inside and outside the classroom, then collect and give feed back to students before major assessments.	
	Exam - Course Test/Quiz - Students will be able to determine when to use the Law of Sines or the Law of Cosines. On the final, the students will be able to complete a problem that uses both of these. **Target for Success:** None set - first cycle.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met The students solve problems on tests, quizzes and homework in which they demonstrate their understanding of trigonometric functions as applied to word problems. (06/09/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** There was a 78.3 success rate. Students were very successful in solving trig equations or evaluating trig functions . However, several students had difficulty in interpreting a word	

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
		problem into math and setting up the solution for the problem.	
		Program Review Reporting Year: 2013-2014 **Target :** Target Not Met 14 out of 39 students correctly answered the question, or 36%. Only 4 could not even begin to answer the question. (12/19/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Need to set a goal where partial credit is also part of the goal.	
	Exam - Course Test/Quiz - Assessment Method: Three midterms consisting of two parts: 1) 20-25 True/False question to assess the students' analytical skills and understanding of the basic trigonometric functions. 2) A three-problem write-in part to assess student understanding of periodic phenomena as they apply to real life situations. The lowest test was dropped. **Target for Success:** Each of the True/False questions is worth 1 point. There is no penalty for wrong answers to encourage "educated" answers through critical thinking. The written part is worth 15-25 points. The problems are taken from the book and tend to be more complex that the True/False ones. A combine score of 60 or above is considered passing. The target for success in this assessment is to have at least 68% of those students completing the course received a passing grade **Comments/Notes:**	**Program Review Reporting Year:** 2019-2020 **Target :** Target Met Students did better on the true/false, but the majority scored above average. (02/06/2020) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students have difficulty translating the words into formulas for the write-in problems.	**Enhancement:** Students need more practice with word problems using web-based homework assignments. (02/06/2020)
		Program Review Reporting Year: 2014-2015 **Target :** Target Met 32 students completed the course. Out of the 32 students 24 had a score of 70 or above. (03/23/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** That implies a success rate of 75% which was above the targeted rate of 68%.	
		Program Review Reporting Year: 2014-2015 **Target :** Target Met The class had an overall 68.2% success rate. (03/14/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Unlike Math 41 and Math 43 which are mainly repetition of the concepts learned in Algebra. Math 42, Trigonometry, is a new topic for most of the students.. It requires a more concentrated effort to grasp the new concepts. A good indicator for success in this class is the student preparedness and the amount of homework a student does. In general, students who do 90% or more of the assigned homework tend to be very successful.	
	Exam - Course Test/Quiz - To do my assessment, I took what I think is the	**Program Review Reporting Year:** 2016-2017	**Enhancement:** In the future, I

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	most comprehensive problem from the final exam for both my Math 42 classes in the fall. I think the problem fits the description of the SLO well. The problem is a navigation type problem where the students must use the ideas of vectors to solve. There is heavy usage of modeling, trigonometry, and geometry. The problem was worth 15 points on the final. So, student received anywhere from a score of 0 to 15. **Target for Success:** My target for success is for students to achieve 70% of the possible points or higher, so roughly 11 out of 15 points.	**Target :** Target Not Met After scoring all the finals, one class received a 67.17% average for the problem and the other class received a 62.55% average. These were kind of close to the 70% target, but obviously fell a little short. (02/11/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Although the target was not met, I was still somewhat satisfied with the results. This was clearly the hardest problem on the test, and required almost everything the students had learned throughout the quarter. **Related Documents:** SLO Data F16.xls	plan, as always, to think of newer and better ways of presenting the material that relates to the problem chosen to do the SLO. (02/11/2017)
	Exam - Course Test/Quiz - To do my assessment, I again took what I think is the most comprehensive problem from the final exam for both my Math 42 classes in the winter. This was the same problem from the fall, so we will be able to compare differences in student achievement. The problem is a navigation type problem where the students must use the ideas of vectors to solve. There is heavy usage of modeling, trigonometry, and geometry. The problem was worth 15 points on the final. So, student received anywhere from a score of 0 to 15. (Active) **Target for Success:** Target for success is 70% completion of the problem or higher.		
	Exam - Course Test/Quiz - Students are asked to solve the following application problem: A ship travels 40 miles due west and	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met Of the 40 students who took this third midterm, 3 students left the problem blank, 29 students answered the question	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	then changes direction northwest to point B. After traveling 30 miles in this new direction, the ship is 56 miles from its point of departure, call it point C. Find the bearing from point B to C. Round to two decimal places. This question is written in a way to test students' ability to formulate, construct, and evaluate trigonometric models to analyze periodic phenomena, identities, and geometric applications. Specifically, they are tested on their use of the law of cosine. **Target for Success:** At least 70% of the students will earn 70% or better on this assessment.	and earned at least 7 out of 10 points and 8 students earned below 7 of the 10 points of the problem. This means that 29/40 (or 72.5%) of the students showed their understanding of the use of law of cosines and how it applies to a bearing problem. (01/02/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I am wondering if it would have been helpful for the 3 students who did not answer the question to have seen a picture of the problem. I am torn on this idea because part of solving an application problem means that the student needs to try to illustrate the scenario, but I understand that there may be some confusion if the problem is not written out as clearly.	
	Exam - Course Test/Quiz - Integrated application problem from final exam **Target for Success:** Students having received 70% of points for problem or above **Comments/Notes:** I've given this type of problem before. Will be interesting to compare past results.	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met Used integrated application problem from final exam to see if students could set up and solve a navigation problem and use the correct trig skills to solve. (04/06/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The target was met easily! The average score on the problem was an 82%, well above the 70% target. I think the target for this class might have been so easily met because this was an MPS class and the students were able to have ample time to practice this type of problem both at home and in group work in the classroom. **Related Documents:** SLO Data W19.xls	**Enhancement:** No enhancements planned at this time. (04/06/2019)
	Exam - Course Test/Quiz - Students were presented with the ferris wheel problem and constructed a trig function based on the period and max & min height. Then, used the trig function to find times for given heights. **Target for Success:** At least 70% of	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met 80% of students completed the problem correctly (at least 90%) (11/01/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Next quarter, I will add stipulations that would result in transformations of the function (increase speed, change height)	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	students complete the problem correctly		
	Exam - Course Test/Quiz - On the second exam of the quarter, students were tested on a bearing problem that involves the use of trigonometric ratios and identities: A ship is 45 miles east and 30 miles south of port. The captain wants to sail directly to port. What bearing should be taken back to port? (5 points) What is the distance directly to the port? (5 points) **Target for Success:** At least 70% of the students will earn at least 7/10 points on this problem that has two parts (each worth 5 points).	**Program Review Reporting Year:** 2019-2020 **Target :** Target Met Of the 44 students who took this exam, 32 of them were able to earn at least 7 of the 10 points on this problem. (01/03/2020) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** It was helpful that we talked about bearing problems in detail prior to taking this exam. I noticed that in the previous quarters that I taught Math 42, the target for this SLO was not met because there was confusion about how to write down the bearings of the ship. By definition, the bearings include the angle created with the north-south line. By making this clear, students were able to perform well on this problem because it appears that the math was straight forward using the trig ratios, but some students would mix up the directions of the ship.	**Enhancement:** I would include another part of this question that requires students to sketch the scenario. That way, it would be clear if there were a misunderstanding about the problem vs a misunderstanding about the definition of bearings. (01/03/2020)

MATH 43:Precalculus III: Advanced Topics

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MATH43_SLO_1 - Analyze, investigate, and evaluate linear systems, vectors, and matrices related to two or three dimensional geometric objects. **SLO Status:** Active **Planned Assessment Quarters:** 2012-13 4-Spring **Outcome Creation Date:** 12/31/2009	**Exam - Course Test/Quiz -** MATH43_SLO_1 has been assessed by the second regular test. **Target for Success:** Target is to obtain at least 70% correct answers by each student. **Related Documents:** MATH-43,F12,Test 2.doc MATH-43,F12,Test 2(SLO 1).docx	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met 70% earned a C or better on the test. The test problems had students implement vectors in physics-focused applications. (04/25/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students did except when applying rules when one vector is reflected on another.	**Enhancement:** More problems/examples involving vector reflected on another including using visuals and having students complete problems already half-solved. (04/25/2018)
		Program Review Reporting Year: 2017-2018 **Target :** Target Met 78% percent of the students earned a C or better on the vector questions from Exam 3. (01/17/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students did well especially considering that the topic of vectors is a new topic for these students.	**Enhancement:** More time should be spent on vectors as was done this time. Make it possible for students to be able take the same instructor for MATH 41 - 43 and encourage such. (01/17/2018)
		Program Review Reporting Year: 2016-2017 **Target :** Target Not Met Less than 64% of students (51/80) scored a 70% or higher on the exam (12/18/2016) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Next time I teach this course I will not allow a note card for exams. I believe the students relied too heavily on their note card and did not study enough on each of their exams this quarter.	
		Program Review Reporting Year: 2013-2014 **Target :** Target Met 30/41 of students obtained 70% or higher on a quiz. (02/28/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students need more work on applications of matrices.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Met The results are the following: at least 90%---19 students; at least 80%---18 students; at least 70%----7 students; at least 60%---0 students; less than 60%----0 students. (01/29/2013)	**Enhancement:** The special assignments on definitions and vocabulary are planned to develop. Also, the homework will be enhanced by the extra questions on the previously

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		Reflection (CLICK ON ? FOR INSTRUCTIONS): The results overall are satisfactory. The distribution of incorrect answers for each question reveals that most of the students had missed the question 5a (31 out of 44) required to give a formal definition of an inverse matrix. This confirm the fact that students pay attention mostly to operational side of the course (calculations), leaving the conceptual side (definitions, vocabulary) undeveloped. Also, question 4 on graphing of the solution set of the quadratic inequality in two variables, has caused difficulties for many students, since the corresponding graphing questions has been covered during Test 1 and many of the students has forgotten the corresponding technique.	covered topics. (11/10/2013) **Enhancement:** The special assignments on definitions and vocabulary are planned to develop. Also, the homework will be enhanced by the extra questions on the previously covered topics. (01/29/2013)
	Exam - Course Test/Quiz - Questions from Exam 1 **Target for Success:** At least 70% correct answers by each student	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Approximately 78% of the questions were answered correctly. (09/22/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students were very proficient in converting word problems to equations by naming the variables & identifying the coefficients. Students were also very proficient in (1) algebraic manipulations to solve for the variables and (2) using their graphing calculator to find the solutions.	**Enhancement:** The special assignments on definitions and vocabulary are planned to develop. Also, the homework will be enhanced by the extra questions on the previously covered topics. (11/10/2013)
	Exam - Course Test/Quiz - Bi-Weekly Quiz **Target for Success:** At least 70% of students receive 7/10 or higher	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met Approximately 70% of students received 70% or better. (03/14/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students who are also engaged in course work such as computer science or physics do well. The others find the concepts difficult to grasp.	**Enhancement:** Give them real life problems. (03/14/2019)
	Exam - Course Test/Quiz - Questions from Exam 1 **Target for Success:** At least 70% correct answers by each student	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met Approximately 82% of the questions were answered correctly. (12/24/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students were very proficient in converting the description of the relationships to equations by naming variables, identifying the coefficients, and constructing the equations. Students	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		were proficient with algebraic manipulations to solve for the variables & using their TI to check their algebraic work.	
	Exam - Course Test/Quiz - The method for assessing the outcome was quiz 7. The questions as the students to perform vector operations and analyze, investigate, and evaluate linear systems. **Target for Success:** 70% of the students will receive 70% or better	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met 80% of the students received 70% or better (04/21/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I was happy with the performance from the students	
	Exam - Course Test/Quiz - Final exam application problem: translate word problem to set of linear equations, translate to augmented matrix, Gaussian elimination to convert to row echelon form, solve system of equations. **Target for Success:** At least 70% earn at least 90% on the problem	**Program Review Reporting Year:** 2019-2020 **Target :** Target Met 26 of 35 students scored at least 90% on the problem (12/23/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Of students who did not earn at least 90%, students made an error in setting up the equations and/or performing Gaussian elimination	**Enhancement:** I will provide additional practice related to setting up systems of equations from applications (12/23/2019)
MATH43_SLO_2 - Graph and analyze regions/curves represented by inequalities or trigonometric, polar, and parametric equations, including conic sections. **SLO Status:** Active **Planned Assessment Quarters:** 2012-13 2-Fall **Outcome Creation Date:** 12/31/2009	**Exam - Course Test/Quiz -** Assessment of MATH43_SLO_2 is based on the results of the first regular test. Additionally, the distribution of the incorrect answers for all questions has been provided and analyzed. **Target for Success:** Target is 70% of correct answers for each student of the class.	**Program Review Reporting Year:** 2017-2018 **Target :** Target Not Met 65% of students received a passing grade. (04/25/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Polar coordinates and conic sections are new topics for students. Much of the issues is the lack of ability to interpret the problem and visualize the problem as appropriate.	**Enhancement:** Advise students to reach out to the tutoring center. (04/25/2018)
		Program Review Reporting Year: 2012-2013 **Target :** Target Not Met Total: 43 students. At least 90%---13 students; at least 80%----17 students; at least 70%----7 students; at least 60%----5 students; less 60%----1 student. (01/29/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Though the distribution of grades overall positive, the target has not been met by 6 students.Two questions, namely 4 and 8, were especially difficault for the students.21 students answered incorrectly question 4 (a polar representation of	**Enhancement:** Questions 4 and 8 are planned to replace by similar, but less challenging questions. A development of special handouts on utilization of graphics calculators for graphing equations in parametric and polar representations. (01/29/2013)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		a given point with given rectangular coordinates) and 21 students answered incorrectly on question 8 on a polar equation of the conic section.	
	Exam - Course Test/Quiz - Questions from Exam 2 **Target for Success:** At least 70% of students answer the questions correctly	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Approximately 72% of the related questions were answered correctly. (09/22/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students were very proficient in shading solution regions by (1) identifying the direction of the inequality & (2) checking by substituting a point. Students were less proficient in sketching polar curves, especially identifying roses, lemniscates, and other complicated polar curves.	**Enhancement:** The special assignments on definitions and vocabulary are planned to develop. Also, the homework will be enhanced by the extra questions on the previously covered topics. (11/10/2013)
	Exam - Course Test/Quiz - Bi-Weekly quiz **Target for Success:** At least 70% of students receive 7/10 or higher	**Program Review Reporting Year:** 2013-2014 **Target :** Target Not Met 21/40 = 52.5% received 7/10 or higher (03/07/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students had trouble graphing parametric equations and converting them to rectangular form. More practice should be done on graphing without a calculator.	
	Exam - Course Test/Quiz - Questions from Exam 2 **Target for Success:** At least 70% of the questions are answered correctly.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met 45% of the questions received at least 90% credit. 25% of the questions received at least 80% credit. (12/24/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students were very proficient in manipulating inequalities to simplify them, sketch the line or curve, and then shade the appropriate section by checking points & checking the direction of the inequality. Students were not proficient in sketching polar curves (such as roses, lemniscates). Their graphs were not correct due to inaccuracies in plotting points & classifying the graphs algebraically.	
	Exam - Course Test/Quiz - The methodology for assessing the outcome was exam 3. The questions on the exam asked students to analyze regions and curves represented by various equations. **Target for Success:** At least 70% of the students will receive 70% or	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met 75% of the students received 70% or better (04/21/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The problems for exam 3 did a good job covering the SLO	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	better.		
	Exam - Course Test/Quiz - Final exam problem: sketch system of inequalities (vertical line, linear function, horizontal parabola) **Target for Success:** At least 70% of students earn at least 90% on problem	**Program Review Reporting Year:** 2019-2020 **Target :** Target Not Met 23 of 35 students earned at least 90% on problem (12/23/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Of students who did not earn at least 90% on problem, many students incorrectly sketched the horizontal parabola	**Enhancement:** To better prepare students, I will provide additional practice with sketching horizontal parabolas (12/23/2019)
MATH43_SLO_3 - Analyze, develop, and evaluate formulas for sequences and series; Justify those formulas by mathematical induction. **SLO Status:** Active **Planned Assessment Quarters:** 2012-13 2-Fall **Outcome Creation Date:** 12/31/2009	**Exam - Course Test/Quiz -** Assessment of MATH43_SLO_3 has been done by the third regular test. Additionally, the distribution of incorrect answers for each question has been provided and analyzed. **Target for Success:** Target is to obtain at least 70% correct answers on the test questions by each student in the class.		
	Exam - Course Test/Quiz - Questions from the final exam **Target for Success:** At least 70% of students answer the questions correctly	**Program Review Reporting Year:** 2017-2018 **Target :** Target Not Met 45% passed the test on induction. (04/25/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students have not developed strong critical thinking skills. Present some very simplistic cases so that students will believe in the method.	
		Program Review Reporting Year: 2013-2014 **Target :** Target Not Met 23/44 students correctly evaluated a sequence formula on the final exam (03/28/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students need more practice with symbolic logic. They struggle applying the nth step to the (n+1)th step in induction. I have more collaborative examples in class.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Met Approximately 77% of related questions were answered correctly. Most difficult topic for the students was the method of mathematical induction. In future I am planning	**Enhancement:** The special assignments on definitions and vocabulary are planned to develop. Also, the homework will be enhanced by the extra

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		to develop an additional assignment to cover the topic in more depth, including examples of using the method for inequalities and in geometry. (09/22/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students were very proficient in using the arithmetic & geometric sequence formulas to find nth terms, given various pieces of information. Students were proficient in proving the arithmetic & geometric series formulas and very proficient in using those formulas to calculate sums.	questions on the previously covered topics. (11/10/2013)
	Exam - Course Test/Quiz - Questions from exam 2 & the final exam **Target for Success:** Correct answers on at least 70% of related questions on the assessments	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met 45% of questions earned at least 90% credit; 35% of questions earned at least 80% credit. Mathematical induction was one of the most difficult topics in the course for students. Students were proficient in using mathematical induction to prove various sum formulas but had more trouble with product formulas and factor relationships. (12/24/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students were very proficient in distinguishing between arithmetic & geometric sequences using (1) sigma notation & (2) when terms were individually written. Students were also very proficient in (1) using arithmetic sum & geometric sum formulas to find nth partial sums & infinite sums; (2) using nth term formulas.	
	Exam - Course Test/Quiz - The methodology for assessing the outcome was exam 2. Several questions asked the students to analyze, develop, and evaluate formulas and to justify the formulas using mathematical induction. **Target for Success:** At least 75% of the students will receive 70% or higher.	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met 76% of the students received 70% or higher (04/21/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** More group work on math induction will be more helpful in future quarters	
	Exam - Course Test/Quiz - Final Exam Problem: Find a formula for partial sum. Then, prove using mathematical induction **Target for Success:** At least 70% of	**Program Review Reporting Year:** 2019-2020 **Target :** Target Not Met 20 of 35 students earned at least 90% on the problem (12/23/2019)	**Enhancement:** In the future, I will provide additional examples, both in lecture and group work, for students to come up with partial

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	students earn at least 90% on problem	**Reflection (CLICK ON ? FOR INSTRUCTIONS):** 9 students were not able to come up with the partial sum formula. 6 students were able to come up with the partial sum formula but not prove the formula using induction	sum formula and prove using mathematical induction (12/23/2019)

MATH 44:Introduction to Contemporary Mathematics

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MATH44_SLO_1 - Analyze contemporary mathematical problems, apply problem solving techniques using a variety of methods, and communicate the results mathematically through a variety of forms. **SLO Status:** Active	**Exam - Course Test/Quiz -** Used problem from final exam. Problem was as follows: Consider the following set of numbers: 035000 141101 Is this a legitimate bar code for a product? Use the correct formula. Remember that the last digit is a check digit. Show all work. This problem was worth 10 points on the final exam. The number of points correct by each student will be tabulated. Each student will therefore be assigned a score between 1 and 10. **Target for Success:** I would want the average score for each student to be 80% or above. **Comments/Notes:** All work had to be shown. Partial credit was given.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met The average score correct on this problem was 84%; I am pleased. (09/21/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I liked this problem. I might try a variation of this problem next time.	
	Exam - Course Test/Quiz - Used problem from final exam. Problem was as follows: Consider the following set of numbers: 035000 141101 Is this a legitimate bar code for a product? Use the correct formula. Remember that the last digit is a check digit. Show all work. This problem was worth 10 points on the final exam. The number of points correct by each student will be tabulated. Each student will therefore be assigned a score between 1 and 10. **Target for Success:** I would want the average score for each student to be	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met The average score for this problem was over a 92%, which is good and above my target of 80%. It is also above the average score of last quarter. (01/03/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I think I am moving in the right direction on teaching this kind of problem. **Related Documents:** SLO Data F13.xls	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	80% or above. **Comments/Notes:** Used same problem last quarter.		
MATH44_SLO_2 - Demonstrate and correctly apply basic mathematical techniques in at least five of the following ten areas: symmetry, graph theory, fractals and chaos theory, topology, number theory, geometry, combinatorics, methods of social choice, probability and statistics, economics and personal finance. **SLO Status:** Active	**Exam - Course Test/Quiz -** I used a problem from the final exam. The problem had two parts. The combined score for both parts is 17 points. The problem was as follows: Consider the object created by doing the following: (i) Start with a solid square. (ii) Make 8 copies of the square, shrink each down to 1/3 its side lengths and arrange the eight to create a bigger square with the middle missing. The first two stages have been done for you (shown in diagram). (a) Draw as accurately as you can, the object at steps 3 and 4. (b) If your answer to part (a) is yes, this is a fractal, compute the dimension of the fractal using the correct formula. Since problem (total) was worth 17 points, each student is assigned a score between 0 and 17. **Target for Success:** I would hope the students would achieve 80% of the possible points or above. **Comments/Notes:** Part (a) was worth 10 points; Part (b) was worth 7 points. All work must be show.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Not Met The average percent correct on this problem was 78.12%. This is still a good score (well above passing) but falls a little below my goal of 80%. (09/21/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Even though I did not meet my goal, I am still pleased with the results. I like this problem for the combination of skills it tests.	
	Exam - Course Test/Quiz - I used a problem from the final exam. The problem had two parts. The combined score for both parts is 15	**Program Review Reporting Year:** 2013-2014 **Target :** Target Not Met Sadly, the average score on this SLO was a 62.27%. I had hoped to reach 80%. This type of problem is somewhat	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	points. The problem was as follows: Consider the object created by doing the following: (i) Start with a solid square. (ii) Make 8 copies of the square, shrink each down to 1/3 its side lengths and arrange the eight to create a bigger square with the middle missing. The first two stages have been done for you (shown in diagram). (a) Draw as accurately as you can, the object at steps 3 and 4. (b) If your answer to part (a) is yes, this is a fractal, compute the dimension of the fractal using the correct formula. Since problem (total) was worth 15 points, each student is assigned a score between 0 and 15. **Target for Success:** I would hope the students would achieve 80% of the possible points or above. **Comments/Notes:** Used basically the same question last quarter. Worth 15 points this time instead of 17.	conceptual and non-algebraic in nature. (01/03/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I will continue to think about new ways of teaching this problem **Related Documents:** SLO Data F13.xls	
MATH44_SLO_3 - Examine and evaluate myths and realities about the contemporary discipline of mathematics and its practitioners. **SLO Status:** Active	**Presentation/Performance -** Here, I assigned an oral report. Each student had to chose a contemporary mathematician to do a report on. Report had to tell of mathematician's life and what he/she worked on. Person chosen to do report on had to be verified by instructor ahead of time, and in most cases was a person from a	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Report average score was 93.2%. I am very pleased. Only reason why average was not higher is because some students did not do report at all, which I need to address better next time. (09/21/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I am pleased with the results and was overjoyed by the level of quality of the reports given. Students were not shy at all (was a possible concern).	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	culturally diverse or gender background. Report was worth 25 points. **Target for Success:** I would like the class average for this report to be 90% or above. **Comments/Notes:** Report had to be at least 500 words, read to the class, and include all necessary diagrams, etc. that explained what mathematician worked on.		
	Presentation/Performance - Here, I assigned an oral report. Each student had to chose a contemporary mathematician to do a report on. Report had to tell of mathematician's life and what he/she worked on. Person chosen to do report on had to be verified by instructor ahead of time, and in most cases was a person from a culturally diverse or gender background. Report was worth 25 points. **Target for Success:** I would like the class average for this report to be 90% or above. **Comments/Notes:** Did the same last quarter.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met This SLO was met excellently. The average score was a 10 out of 10. Everybody who did a presentation did a good job and thankfully, everybody that completed the class (although not all passed) finished this assignment. (01/03/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** I will continue to do this assignment. **Related Documents:** SLO Data F13.xls	

MATH 46:Mathematics for Elementary Education

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MATH46_SLO_1 - Analyze mathematical problems from elementary mathematics, apply problem solving techniques using a variety of methods, solve these problems individually and in groups, and communicate results mathematically through a variety of forms. **SLO Status:** Active	**Exam - Course Test/Quiz -** Questions on Exam **Target for Success:** Successfully answering question	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met On the final, there were several questions related to SLO1 that were asked: 1. Using a 2x2 grid, how many way are there to get from Point P to Point Q (application of pascal's triangle) 2. Game consists of two players. Each player takes turns putting down 1,2, or 3 sticks. The first player to leave a total of 40 sticks wins the game. What is the winning strategy. 13. The mental arithematic technique of easy combinations is 40. Which of the following is not a step in the Polya's problem solving principles (12/11/2012) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** the average number of correct answers for problems 1,2,13,and 40 were 2.86 or about 71% which would indicate that class was able to understand majority of the activities around SLO1	
MATH46_SLO_2 - Utilize ideas from number theory, distinguish types and properties of numbers, and employ mathematical rules for operating on rational and irrational numbers using verbal, symbolic, geometric, and numerical methods. **SLO Status:** Active	**Exam - Course Test/Quiz -** Exam Questions **Target for Success:** Ability to answer questions satisfactorily.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met On Final Exam, questions 12,19,20,25,26, and 36 related to SLO-2: 12. Using units, strips, and mats, how would you represent the number 325? 19. Which of the following represents -2? 20. At mail time, you are delivered a check of $48 and a bill for $31. Which of the following represent this situation: 25. Which of the following represent 2/6? 26. Which of the followign represent 2 x 3/5? 36. To see if a number is divisible by 9, we added up the digits and determine: (12/11/2012) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The class average for number of correct answers to above was 5.13 or about 73.33% which implies that students were adequately able to learn/apply SLO 2.	

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MATH46_SLO_3 - Examine and evaluate myths and realities about the contemporary discipline of mathematics and its practitioners. **SLO Status:** Active	**Focus Group -** Focus groups: students divided into small discussion groups and asked to make list of ways in which course addressed myths and realities of mathematics and report in larger class discussion. **Target for Success:** Students identify and analyze myths and realities successfully, and identify specific activities in the class which addressed these issues. **Comments/Notes:** Examples of class topics identified by students: (1) Alternative or unconventional calculation algorithms and their history and usage (2) Recent writings by Keith Devlin and others on "the math gene," which posit that nearly all human beings "have a math mind." (3) Contemporary videos by Vi Hart, Dan Meyers and others presenting mathematical ideas and issues in math education in entertaining manner (4) A variety of stories from recent and past history relating to who and how people have done mathematics (5) Findings of the Brazilian Street Math study, and related recent studies on the influence of context in success in mathematical problem solving. (6) How number theory is used in credit card and other codes demonstrates the ubiquity of mathematics		
	Other - Journals: students create		

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	journal entry for each class session, including discussion of aspects of this SLO. **Target for Success:** Students identify and analyze myths and realities successfully, and identify specific activities in the class which addressed these issues.		
MATH46_SLO_4 - Identify and discuss developments in the history of elementary mathematics from a variety of cultures. **SLO Status:** Active	**Exam - Course Test/Quiz -** Exam Questions **Target for Success:** Satisfactorily answering exam questions.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met On Final exam, questions 8 and 9 were based on SLO 4: 8. Write 27,408 in Mayan Notation 9. Translate the following Babylonian number into base 10 (12/11/2012) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** on average, students got 1.6 or 80% correct on the above questions so they were able to satisfactorily learn/apply SLO-4	

MATH 76 (&X&Y):Special Projects in Probability and Statistics

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MATH76(&X&Y)_SLO_1 - Investigate an area of special interest in the fields of probability and statistics and demonstrate an appropriate level of understanding and expertise. **SLO Status:** Special Projects **Outcome Creation Date:** 08/24/2015			

MATH 77(&X&Y):Special Projects in Mathematics

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MATH77_SLO_1 - Investigate an area of special interest and demonstrate an appropriate level of understanding and expertise. **SLO Status:** Active			

MATH 78 (&X&Y):Special Projects in Pure Mathematics

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MATH78(&X&Y)_SLO_1 - Investigate an area of special interest in pure mathematics and demonstrate an appropriate level of understanding and expertise. **SLO Status:** Special Projects **Outcome Creation Date:** 08/24/2015			

MATH 79 (&X&Y):Special Projects in Applied Mathematics

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MATH79(&X&Y)_SLO_1 - Investigate an area of special interest in applied mathematics and demonstrate an appropriate level of understanding and expertise. **SLO Status:** Special Projects **Outcome Creation Date:** 08/24/2015			

Assessment: Course/Service Four Column

Dept - (PSME) Chemistry

CHEM 10:Introductory Chemistry

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
CHEM10_SLO_1 - Acquire a fundamental understanding of what information is presented in the periodic table of the elements. **SLO Status:** Archived SLO Statement **Outcome Creation Date:** 04/10/2013	**Exam - Course Test/Quiz -** Question used: In Berzelius's experiments which illustrated the law of definite proportions, 10.00 grams of lead reacts with 1.55 grams of sulfur and produced 11.55 grams of lead sulfide. When the same amount of lead were left to react with excessive amount of sulfur, 3.00 grams, again 11.55 grams of lead sulfide were produced along with 1.45 grams of sulfur left. How many grams of lead sulfide will be produced when 18.00 grams of lead reacts with 1.55 grams of sulfur? A) 11.55 g B) 19.55 g C) 18.00 g D) 8.00 g **Target for Success:** 70% (This is much higher than the average success rate of around 60% based on American Chemical Society).	**Program Review Reporting Year:** 2012-2013 **Target :** Target Not Met 22 out of 45 (50%) students answered this question correctly. (03/26/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** SLO #1 is quite general and somewhat philosophical for the audience of Chem 10. As non-major students, they might not need to analyze chemical data with the scientific method in their profession, be it what they choose. It is proposed that the outcome statement be changed to to "Acquire a fundamental understanding of what information is presented in the periodic table of the elements." The periodic table of the elements is probably seen by anyone who has received some formal education. A demonstration on what information one can obtain from this table would have Chem 10 serve its audience as part of their general education requirement. This will be assessed in the next cycle.	**Enhancement:** Change outcome statement and re-evaluate the outcome. (04/02/2013)
CHEM10_SLO_2 - Evaluate the relationship between molecular structure and chemical properties of	**Exam - Course Test/Quiz -** Based on the Lewis structures, which of the following molecule is polar?	**Program Review Reporting Year:** 2012-2013 **Target :** Target Not Met 23 out of 45 (50%) students answered this question	**Enhancement:** Change outcome statement and re-evaluate. New outcome to be assessed:

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
compounds. **SLO Status:** Archived SLO Statement	A) CO_2 B) CH_4 C) NH_3 D) H_2 **Target for Success:** 70% (This is much higher than the average success rate as defined by the American Chemical Society).	correctly. (03/26/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** SLO #2 is quite advanced for the audience of Chem 10. It would be appropriate for students taking organic chemistry. As non-major students, they do not need to be able to draw molecular structures and make predictions on molecular properties. It is proposed that outcome statement for SLO #2 be changed to "Demonstrate a fundamental understanding of the octet rule in predicting how elements combine to form chemical compounds". The proposed SLO #1 addresses the alphabet of chemistry, and the proposed SLO #2 points out the essence of a chemical reaction: how to combine letters to form words in the language of chemistry. Question used to evaluate the proposed SLO #2: What is the predicted ionic charge for a Na ion? A) + 1 B) + 2 C) + 3 D) – 1 36 out of 45 (80%) students answered this question correctly.	Demonstrate a fundamental understanding of the octet rule in predicting how elements combine to form chemical compounds (04/02/2013)
CHEM10_SLO_3 - Demonstrate an understanding of chemical principles such as atomic structure, chemical bonding, mole concept, and acids and bases **SLO Status:** COR_Update_Necessary **Planned Assessment Quarters:** 2016-17 4-Spring **Outcome Creation Date:** 10/02/2015	**Exam - Course Test/Quiz -** A mid term exam in which the concepts in the SLO are tested **Target for Success:** 70%	**Program Review Reporting Year:** 2016-2017 **Target :** Target Not Met The average score on the exam was 68% (03/22/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The target was not met. Improvements needed in the text.	**Enhancement:** A new textbook that will discuss chemistry in a context will be used from the Fall of 2017. (03/22/2017)
CHEM10_SLO_4 - Demonstrate an understanding of the scientific method by performing laboratory experiments **SLO Status:** COR_Update_Necessary	**Laboratory Project -** Use lab quizzes or exams **Target for Success:** 70%	**Program Review Reporting Year:** 2016-2017 **Target :** Target Not Met 68% (03/22/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Lab	**Enhancement:** A new lab curriculum is being developed. (03/22/2017)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
Planned Assessment Quarters: 2016-17 4-Spring **Outcome Creation Date:** 10/02/2015		experiments need to be improved. Labs need to be contextual and must lead to critical thinking and must be more interesting and things students can relate to in everyday life. Labs must also teach students good skills and techniques.	
CHEM10_SLO_5 - Develop problem solving techniques by applying the \Scientific Method\" to chemical data." **SLO Status:** Active_Pending_Revision **Outcome Creation Date:** 02/10/2018			
CHEM10_SLO_6 - Analyze and solve chemical questions utilizing information presented in the periodic table of the elements. **SLO Status:** Active_Pending_Revision			
CHEM10_SLO_7 - Evaluate current scientific theories and observations utilizing a scientific mindset and an understanding of matter and the changes it undergoes. **SLO Status:** Active_Pending_Revision			

CHEM 12A:Organic Chemistry

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
CHEM12A_SLO_1 - Predict the product of a chemical reaction. **SLO Status:** Active_Pending_Revision	**Exam - Course Test/Quiz -** An incomplete chemical reaction was provided and students were asked to predict the products of that reaction. **Target for Success:** 70% (which is higher than the national average success rate reported by the American Chemical Society).	**Program Review Reporting Year:** 2012-2013 **Target :** Target Not Met Number of Responses: 38 Number of Correct: 24 Number of Incorrect:14 Average % Correct: 63% (12/10/2010) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** A detailed reflection is provided at the end of the final outcome.	**Enhancement:** A detailed action plan is provided at the end of the final outcome. (04/02/2013)
CHEM12A_SLO_2 - Apply principles of thermodynamics, kinetics, and equilibrium to organic reaction systems. **SLO Status:** Active_Pending_Revision	**Exam - Course Test/Quiz -** Select the rate law for the following reaction CH¬3CH2CH2CHBrCH3 + OH- ? Br- + CH¬3CH2CH2CHOHCH3 **Target for Success:** 70% (which is higher than the national average success rate reported by the American Chemical Society)	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Number of Responses: 38 Number of Correct: 28 Number of Incorrect:10 Average % Correct: 74% (12/10/2010) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** A detailed reflection is provided at the end of the final outcome.	**Enhancement:** A detailed action plan is provided at the end of the final outcome. (04/02/2013)
CHEM12A_SLO_3 - Generate logical stepwise reaction mechanisms. **SLO Status:** Active_Pending_Revision	**Exam - Course Test/Quiz -** Provide a mechanistic explanation for the formation of the observed products in the following reaction. (A chemical reaction was provided). **Target for Success:** 70% (which is higher than the national average success rate reported by the American Chemical Society)	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Number of Responses: 38 Total points possible: 10 % students obtaining 70% or above (7/10 pts): 29% (11 students) % students obtaining 50% or above (5/10 pts): 24% (9 students) % students obtaining 20% (3/15 pts): 15% (47% students) (12/10/2010) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** A detailed reflection is provided at the end of the final outcome.	**Enhancement:** A detailed action plan is provided at the end of the final outcome. (04/02/2013)
CHEM12A_SLO_4 - Construct molecular structure from spectroscopic data. **SLO Status:** Active_Pending_Revision	**Exam - Course Test/Quiz -** An Unknown Compound, L, has the formula C5H10O2. Elucidate the structure of L by scrutinizing it IR, 1H	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Total points possible: 20 % students obtaining 100% points possible (20/20 pts): 61%	**Enhancement:** One major shortcoming of our assessment is that we were unable to obtain any information regarding the student

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	NMR and 13C NMR spectra shown below. **Target for Success:** 70% (which is higher than the national average success rate reported by the American Chemical Society).	(23 students) % students obtaining 70% or above (14/20 pts): 16% (6 students) % students obtaining 69% or below: 23% (9 students) (12/10/2010) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The national success rate in chemistry (based on data from nsf.gov and acs.org) is between 65-70%. Most of the data from the assessment of the outcomes indicate that De Anza College chemistry students are performing well above the national average. The assessment of outcomes 1 and 3 in this class shows somewhat below average results. However, a closer look at the outcome statements shows that these outcomes pertains to predicting reaction products and reaction mechanisms, concepts that students have been introduced to for the first time in the organic chemistry sequence (12A, B, C). These concepts are further examined in greater detail in the next class in this sequence. We anticipate that student understanding of these concepts will have significantly improved in the next class in this sequence. Assessment data from outcome statements 2 and 4 are particularly impressive. Both of these topics are discussed throughout the quarter and with continuous exposure and practice, students were able to gain a thorough understanding of this material.	learning in the laboratory, which is a significant component of this class (25-30% of the overall student grade). However, we have proposed to assess the laboratories during our program level assessments. (04/02/2013)
CHEM12A_SLO_5 - Predict products in reactions of alkanes, haloalkanes, and alkenes by applying concepts from General Chemistry **SLO Status:** COR_Update_Necessary **Planned Assessment Quarters:** 2016-17 3-Winter **Outcome Creation Date:** 10/02/2015	**Exam - Course Test/Quiz -** Final exam **Target for Success:** 70%	**Program Review Reporting Year:** 2016-2017 **Target :** Target Not Met 67% Average score (03/24/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** CHEM 12ABC is a year long organic chemistry sequence. A combined reflection statement is noted for all the SLOs in these classes at the end of CHEM 12C.	
CHEM12A_SLO_6 - Generate logical stepwise reaction mechanisms for	**Exam - Course Test/Quiz -** Final	**Program Review Reporting Year:** 2016-2017	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
simple organic reactions **SLO Status:** COR_Update_Necessary **Planned Assessment Quarters:** 2016-17 2-Fall **Outcome Creation Date:** 10/02/2015	exam **Target for Success:** 70%	**Target :** Target Not Met 59% average score. (03/24/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** CHEM 12ABC is a year long organic chemistry sequence. A combined reflection statement is noted for all the SLOs in these classes at the end of CHEM 12C	
CHEM12A_SLO_7 - Construct molecular structures from IR and 1H NMR data **SLO Status:** COR_Update_Necessary **Planned Assessment Quarters:** 2016-17 2-Fall **Outcome Creation Date:** 10/02/2015	**Exam - Course Test/Quiz -** Lab final exam **Target for Success:** 70%	**Program Review Reporting Year:** 2016-2017 **Target :** Target Not Met 69% average score (03/24/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** CHEM 12 ABC is a year long organic chemistry sequence. A combined reflection statement is noted for all the SLOs in these classes at the end of CHEM 12C.	

CHEM 12B:Organic Chemistry

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
CHEM12B_SLO_1 - Apply molecular orbital theory to predict the outcome of selected chemical reactions. **SLO Status:** Active_Pending_Revision	**Exam - Course Test/Quiz -** A chemical reaction was provided and students were asked to predict the products formed. **Target for Success:** 70% (which is higher than the national average success rate reported by the American Chemical Society)	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Number of Responses: 33 Number of Correct: 32 Number of Incorrect:1 Average % Correct: 97% (03/31/2011) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** A detailed reflection is provided at the end of the final outcome	**Enhancement:** A detailed action plan is provided at the end of the final outcome. (04/02/2013)
CHEM12B_SLO_2 - Apply resonance theory to predict the major and minor products of chemical reactions. **SLO Status:** Active_Pending_Revision	**Exam - Course Test/Quiz -** Students were asked to predict the kinetic product of a chemical reaction. **Target for Success:** 70% (which is higher than the national average success rate reported by the American Chemical Society)	**Program Review Reporting Year:** 2012-2013 **Target :** Target Not Met Number of Responses: 33 Number of Correct: 18 Number of Incorrect:13 Average % Correct: 55% (03/25/2011) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** A detailed reflection is provided at the end of the final outcome.	**Enhancement:** A detailed action plan is provided at the end of the final outcome. (04/02/2013)
CHEM12B_SLO_3 - Generate logical multi-step syntheses of increasingly complex molecules. **SLO Status:** Active_Pending_Revision	**Exam - Course Test/Quiz -** Propose a synthesis for the product given below using the indicated starting materials as the only sources of carbon. **Target for Success:** 70% (which is higher than the national average success rate reported by the American Chemical Society)	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Number of Responses: 33 Total points possible: 20 % students obtaining 100% points possible (20/20 pts): 67% (22 students) % students obtaining 85% (17/20 pts): 15% (5 students) % students obtaining 75% (15/20 pts): 6% (2students) % students obtaining 50% (10/20 pts): 12% (4 students) (03/25/2011) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** A detailed reflection is provided at the end of the final outcome.	**Enhancement:** A detailed reflection is provided at the end of the final outcome. (04/02/2013)
CHEM12B_SLO_4 - Construct logical stepwise reaction mechanisms for increasingly complex chemical systems. **SLO Status:** Active_Pending_Revision	**Exam - Course Test/Quiz -** Propose a mechanism for the following reaction (a chemical reaction was provided) **Target for Success:** 70% (which is	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Number of Responses: 33 Total points possible: 15 % students obtaining 100% points possible (15/15 pts): 64%	**Enhancement:** Action plan is currently pending. (04/02/2013)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	higher than the national average success rate reported by the American Chemical Society)	(21 students) % students obtaining 80% (12/15 pts): 15% (5 students) % students obtaining 53% (8/15 pts): 6% (2 students) % students obtaining 20% (3/15 pts): 15% (5 students) (03/25/2011) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** A reflection is currently pending.	
CHEM12B_SLO_5 - Construct logical multi-step syntheses for organic molecules incorporating a variety of functional groups. **SLO Status:** COR_Update_Necessary **Planned Assessment Quarters:** 2016-17 3-Winter **Outcome Creation Date:** 10/02/2015	**Exam - Course Test/Quiz -** Final exam **Target for Success:** 70%	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met 78% (03/24/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** CHEM 12 ABC is a year long sequence in organic chemistry. A combined reflection statement is noted for all the SLOs in these classes at the end of CHEM 12C	
CHEM12B_SLO_6 - Use molecular orbital theory and resonance to explain reactions of conjugated dienes, benzene and other molecules with conjugated p systems **SLO Status:** COR_Update_Necessary **Planned Assessment Quarters:** 2016-17 3-Winter **Outcome Creation Date:** 10/02/2015	**Exam - Course Test/Quiz -** Final exam **Target for Success:** 70%	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met 85% (03/24/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** CHEM 12 ABC is a year long sequence in organic chemistry. A combined reflection statement is noted for all the SLOs in these classes at the end of CHEM 12C	
CHEM12B_SLO_7 - Construct molecular structures of increasingly complex molecules from IR, 1H NMR, and 13C NMR data **SLO Status:** COR_Update_Necessary **Planned Assessment Quarters:** 2016-17 3-Winter **Outcome Creation Date:** 10/02/2015	**Exam - Course Test/Quiz -** Lab final exam **Target for Success:** 70%	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met 69% (03/24/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** CHEM 12 ABC is a year long sequence in organic chemistry. A combined reflection statement is noted for all the SLOs in these classes at the end of CHEM 12C	

CHEM 12C:Organic Chemistry

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
CHEM12C_SLO_1 - Apply the principles of thermodynamics, kinetics, equilibrium to biologically important molecules. **SLO Status:** Active_Pending_Revision **Planned Assessment Quarters:** 2013-14 1-Summer **Outcome Creation Date:** 04/22/2014	**Exam - Course Test/Quiz -** An incomplete chemical reaction was present and the student was asked to provide the missing compound(s). **Target for Success:** 70%	**Program Review Reporting Year:** 2013-2014 **Target :** Target Not Met Average: 29/48 (60%) Standard deviation: 10 Median: 29.5 n: 26 (04/22/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Aside from the unfortunate fact that the target for this outcome was not met, the data indicate a wide variability in student success. In this problem, the student was presented with a series of chemical reactions in which the substrate, reagent, or product was missing, and the student had to provide the appropriate compound(s) for each reaction. The problem focused on one core ability in organic chemistry: to be able to identify the type of chemical reaction based on the changes in molecular structure that occur or the set of reagents indicated. The student must be able to identify the transformation that is occurring, the types of substrates that normally undergo this transformation, and, in many cases, the stereochemical and regiochemical consequences for the products that are formed based on the reagents used. The student must also be aware of specific reaction conditions (for example, temperature or pH) that may be associated with a particular transformation. This “fill-in-the-blank” problem is distinct from a mechanism problem – in which students must show the step-by-step flow of electrons during a chemical reaction – or a synthesis problem – for which the student must devise a viable synthetic route based on the given starting materials. While all three of these types of problems – fill-in-the-blank, mechanism, and synthesis – are found on all major assessments for the course (exams and the final) as well a several of the minor assessments (quizzes), the data indicate that more emphasis needs to be placed on quickly and correctly identify reactions by the reagents used or the transformation that occurs.	**Enhancement:** Reassess this outcome during the Spring 2014 quarter to track progress and allow a comparison between the regular and summer sessions. (04/22/2014)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		It is recommended that this outcome again be assessed in the Spring 2014 quarter (the next time the course is offered) to track the progress towards achieving the target.	
CHEM12C_SLO_2 - Conduct sectroscopic analysis and identifiy structures of biologically important molecules. **SLO Status:** Active_Pending_Revision **Planned Assessment Quarters:** 2013-14 1-Summer **Outcome Creation Date:** 04/22/2014	**Exam - Course Test/Quiz -** There are five important structural features by which cyclic monosaccharides can be described. For each of those five structural features, first write a description of that structural feature, then state two terms used to describe that structural feature and define each term. **Target for Success:** 70%	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met Average: 13/16 (78%) Standard deviation: 5 Median: 15 n: 26 (04/22/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** In this question, the student was asked to identify five key structural features of carbohydrates: the type of functional group (aldehyde versus ketone), the size of the ring that could form during cyclization (furanose versus pyranose), the number of carbons in the sugar (triose, tetrose, pentose, etc.), the configuration of the ultimate stereocenter (d versus l), and the configuration of the anomeric position upon cyclization (alpha versus beta). Although the target for this assessment was met, it is recommended that this outcome be split into two outcomes to separately address the spectroscopic identification of biological molecules.	**Enhancement:** Reassess this outcome during the Spring 2014 quarter to track progress and allow a comparison between the regular and summer sessions. (04/22/2014)
CHEM12C_SLO_3 - Generate stepwise reaction mechanisms of biologically important molecules. **SLO Status:** Active_Pending_Revision **Planned Assessment Quarters:** 2013-14 1-Summer **Outcome Creation Date:** 04/22/2014	**Exam - Course Test/Quiz -** The reagents for four different reactions were presented. For each reaction, the student was asked to write a complete mechanism for the reaction, indicating all mechanism arrows, charges, and lone electrons, and properly reflecting stereochemistry and regiochemistry where appropriate. **Target for Success:** 70%	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met Average: 23/32 (72%) Standard deviation: 6 Median: 23 n: 26 (04/22/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** This question explored the ability to write a complete, detailed reaction mechanism, showing the step-by-step flow of electrons during a particular chemical reaction. Along with retrosynthetic analysis, the elucidation, understanding, and application of reaction mechanism is one of the cornerstones of modern organic chemistry. By understanding the mechanism of a reaction, the student	**Enhancement:** Reassess this outcome during the Spring 2014 quarter to track progress and allow a comparison between the regular and summer sessions. (04/23/2014)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		can successfully predict the outcome of a reaction, not only in terms of correctly identifying the functional group transformation that may occur, but also the sterochemical and regiochemical consequences of the reaction. It is therefore reassuring to see that, as a whole, the students were successful in writing the mechanisms for the reactions presented in this problem, as the reactions were representative of key mechanisms presented during the quarter. Although the target for this assessment was met, it recommended that the wording of this assessment be broadened to include molecules that are not directly important biologically, to more faithfully reflect both the intent and the method used in this assessment.	
CHEM12C_SLO_4 - Design logical syntheses and structural modifications of biologically important molecules. **SLO Status:** Active_Pending_Revision **Planned Assessment Quarters:** 2013-14 1-Summer **Outcome Creation Date:** 04/22/2014	**Exam - Course Test/Quiz -** The student was present with two target compounds. For each compound, the student was asked to present a multi-step synthetic route in which the target molecule would be synthesized from a given set of starting materials. **Target for Success:** 70%	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met Average: 13/18 (74%) Standard deviation: 4 Median: 14 n: 26 (04/23/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** This question assessed the ability of the student, given a particular set of starting materials, to identify the sequence of reagents that should be used to accomplish a significant synthetic transformation. The question required the student to apply the principles of retrosynthetic analysis to identify potential synthetic intermediates and, thereby, viable synthetic routes. In identifying these routes, the student must take into consideration the changes in functional groups or the carbon framework that occur, along with any relevant stereochemical or regiochemical changes. Although the target was met, it is recommended that the wording of this assessment be broadened to include molecules that are not directly important biologically, to more faithfully reflect both the intent and the method used in this assessment.	**Enhancement:** Reassess this outcome during the Spring 2014 quarter to track progress and allow a comparison between the regular and summer sessions. (04/23/2014)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
CHEM12C_SLO_5 - Generate logical multi-step syntheses for increasingly complex organic molecules incorporating a wider variety of functional groups **SLO Status:** COR_Update_Necessary **Planned Assessment Quarters:** 2015-16 4-Spring **Outcome Creation Date:** 10/02/2015	**Exam - Course Test/Quiz -** Final exam **Target for Success:** 70%	**Program Review Reporting Year:** 2016-2017 **Target :** Target Not Met 50% average on the final exam. (03/25/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** CHEM 12 ABC is a year long general chemistry sequence. A combined reflection statement is noted for all the SLOs in these classes at the end of CHEM 12C.	
CHEM12C_SLO_6 - Apply concepts demonstrated in previous organic reactions to understand the behavior of biologically important molecules and concepts in Biochemistry **SLO Status:** COR_Update_Necessary **Planned Assessment Quarters:** 2015-16 4-Spring **Outcome Creation Date:** 10/02/2015	**Exam - Course Test/Quiz -** Exam **Target for Success:** 70%	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met 84% average on the final exam. (03/25/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Our current success levels in Chemistry 12A and 12B point to structural needs within the department. Most noticeably, we have a real need for more full time instructors. Our department has seen a lot of new adjunct faculty in the last couple years, particularly in the General Chemistry series. While our adjunct faculty perform very well, having instructors who are learning how our labs and department works does put some students at a disadvantage. Established instructors completely familiar with the program are the best resource for all students, but especially those facing the increased challenges common among historically underperforming groups. This is even more important in Organic Chemistry, a course which challenges even the very best students. Increasing our number of full time faculty would help ensure that the program and the students are getting the continuing attention they require in order to succeed. In addition, with respects to SLOs 12A3 and 12B3, our lab program is suffering from a lack of support. We have requested additional help in our stockroom for several years and find ourselves stymied in our efforts to grow and improve our program in its absence. Additional stockroom support would ensure that scheduled labs are fully capable of covering all lab topics by ensuring access to the needed chemicals in appropriate purity and that all instrumentation is working properly. Our current lab staff is not sufficient to adequately cover all the demands of our department,	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		particularly given the increase in regulatory oversight and restrictions.	

CHEM 1A:General Chemistry

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
CHEM1A_SLO_1 - Identify and explain trends in the periodic table. **SLO Status:** Active_Pending_Revision	**Exam - Course Test/Quiz -** (a) Which has a greater affinity for electrons (a more negative value of electron affinity) and why? Sodium or Magnesium (b) Which has a greater ionization energy and why? Nitrogen or oxygen **Target for Success:** 70% (which is much higher than the national average success rate as presented by the American Chemical Society).	**Program Review Reporting Year:** 2012-2013 **Target :** Target Not Met Average: 2.5/5 Standard Deviation: 2/5 Median: 3/5 (07/29/2010) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** A consolidated reflection has been provided at the end of the three outcomes.	**Enhancement:** A consolidated enhancement plan is provided in outcome # 3 (04/02/2013)
CHEM1A_SLO_2 - Construct balanced reaction equations and illustrate principles of stoichiometry. **SLO Status:** Active_Pending_Revision	**Exam - Course Test/Quiz -** How many grams of phosphine (PH3) can form when 37.5 g of phosphorous and 83.0 L of hydrogen has react at STP? P4(s) + H2(g) ? PH3(g) [unbalanced] **Target for Success:** 70% (which is higher than the national average success rate reported by the American Chemical Society)	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Average: 8.1/10 Standard Deviation: 2.6/10 Median: 10/10 (07/29/2010) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** A comprehensive reflection statement is provided at the end of outcome # 3	**Enhancement:** A consolidated reflection statement is provided at the end of outcome # 3 (04/02/2013)
CHEM1A_SLO_3 - Apply the first law of thermodynamics to chemical reactions. **SLO Status:** Active_Pending_Revision	**Exam - Course Test/Quiz -** High purity benzoic aicd (C6H5COOH; ?Hrxn for combustion = -3227 kJ/mol) is used as a standard for calibrating bomb calorimeters. A 1.221-gram sample of benzoic acid is burned in a bomb calorimeter whose heat capacity is 1365 J/°C. What is the observed temperature change?	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Average: 8.4/10 Standard Deviation: 2.7/10 Median: 10/10 (04/02/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The national success rate in chemistry (based on data from nsf.gov and acs.org) is between 65-70%. The assessment data of the	**Enhancement:** This data is from a relatively small sample size (one group of 25 students during the summer quarter). In order to have a more comprehensive assessment of the learning outcomes, we plan to evaluate the outcomes in more sections. Also, the current assessment only

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	Target for Success: 70% (which is higher than the national average success rate as reported by the American Chemical Society).	outcomes for this chemistry class indicates that the performance of De Anza College chemistry students is above the national average. From this limited sample, we were still able to arrive at some interesting conclusions. Outcome statement one, for instance, stems from a conceptual learning objective and student's data here indicated a lower success rate than in outcome statement three which involved numerical problem solving skills. Even more interesting, the objectives related to SLO-1 are not directly dealt with in any of the laboratory experiments. Whereas the objectives related to SLO-3 are discussed via a laboratory experiment besides in lecture. This data supports our theory that laboratory experiences that closely parallel material discussed in the lecture is essential for students to be successful in chemistry. Ideally, it would be beneficial to the students if we were to modify the laboratory program to incorporate experiments perfectly aligned with the lecture. The limiting factor in having a highly challenging and exceptional laboratory program is primarily due to limitations in resources. Specifically, the staffing situation in our laboratories is sub-par; we have one staff member undertaking the responsibilities of three entirely different positions (stockroom manager, hazardous waste manager, laboratory coordinator). Changes to our laboratory curriculum involve great deal of planning: developing new laboratory experiments, ordering required chemicals and other supplies, writing a new laboratory manual, creating waste labels, organizing different necessary equipment, training student workers in appropriate laboratory preparations, just to name a few. All of these tasks require large investments of time from both the faculty and the single stockroom personnel. While the faculty may be able to develop new and interesting laboratory experiments, it is impossible to implement these without complete synergy	evaluated the lecture component of the class. This class has a laboratory component, which is weighted, at 25% -30% of the student's total performance in the class. In a future term, we plan to evaluate and assess the outcomes in the laboratory as well. (04/02/2013)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		with the (lone) stockroom personnel. Students will greatly benefit from a richer laboratory experience, and this is likely to lead to a much improved accomplishment and success of the learning outcomes. However, due to limitations in resources such projects are currently purely theoretical concepts.	
CHEM1A_SLO_4 - Solve problems related to balanced chemical equations and illustrate the principles of stoichiometry. **SLO Status:** COR_Update_Necessary **Planned Assessment Quarters:** 2016-17 3-Winter **Outcome Creation Date:** 10/02/2015	**Exam - Course Test/Quiz -** Mid term exam covering these topics. **Target for Success:** 70%	**Program Review Reporting Year:** 2016-2017 **Target :** Target Not Met 64.1% average score on the first mid term exam in sections 6/62 in the winter quarter. Exam administered on January 29th by Elizabeth Pollom. (03/25/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** CHEM 1 ABC is a year long general chemistry sequence. A combined reflection statement is noted for all the SLOs in these classes at the end of CHEM 1C.	
CHEM1A_SLO_5 - Demonstrate an understanding of the scientific method by performing laboratory experiments. **SLO Status:** COR_Update_Necessary **Planned Assessment Quarters:** 2016-17 3-Winter **Outcome Creation Date:** 10/02/2015	**Laboratory Project -** Lab exam **Target for Success:** 70%	**Program Review Reporting Year:** 2016-2017 **Target :** Target Not Met 58% average score in the lab final exam (03/25/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** CHEM 1 ABC is a year long general chemistry sequence. A combined reflection statement is noted for all the SLOs in these classes at the end of CHEM 1C.	

CHEM 1B:General Chemistry

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
CHEM1B_SLO_1 - Demonstrate a knowledge of intermolecular forces. **SLO Status:** Archived SLO Statement	**Exam - Course Test/Quiz -** 1. The following questions pertain to intermolecular forces. a. What is meant by polarizability? b. Which of the following atoms would you expect to be most polarizable: O, S, Se or Te? Explain. c. Put the following molecules in increasing order (lowest to highest) of polarizability: GeCl4, CH4, SiCl4, SiH4, and GeBr4. d. Arrange the above substances from lowest boiling point to highest boiling point. 2. What is the strongest intermolecular force in each of the following: a. CH3Cl: b. CH3CH3: c. NH3: d. CH3OH: e. Cl2: **Target for Success:** 70% (which is higher than the national success rate as reported by the American	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Section 1 Section 2 Average: 7.6/10 Average: 7.8/10 Standard Deviation: 2.4/10 Standard Deviation: 2.2/10 Median: 7.8/10 Median: 8/10 (06/25/2010) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** A comprehensive reflection is provided at the end of the final outcome.	**Enhancement:** A consolidated action plan is provided at the end of the final outcome. (04/02/2013)

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
	Chemical Society).		
CHEM1B_SLO_2 - Evaluate the principles of molecular kinetics. **SLO Status:** Active_Pending_Revision	**Exam - Course Test/Quiz -** 1. Consider the following hypothetical aqueous reaction: A(aq) ? B(aq). The following table is the moles of A measured at various times. The reaction volume is 100.0 ml Time (min) Moles of A 0 0.065 10 0.051 20 0.042 30 0.036 40 0.031 (a) Calculate the number of moles of B at each time in the table, assuming there are no molecules of B at time 0. (b) Calculate the average rate of disappearance of A for each 10-minute interval, in units of M/s. 2. Experiments show that each of the following reactions is second order overall: Reaction 1: NO2(g) + CO(g) ? NO(g) + CO2(g) Reaction 2: NO(g) + O3(g) ? NO2(g) + O2(g) a. When [NO2] in reaction 1 is doubled, the rate quadruples (becomes 4 times). Write the rate	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Assessment results: Section 1 Section 2 Average: 6.4/10 Average: 6.5/10 Standard Deviation: 3.6/10 Standard Deviation: 3.3/10 Median: 6.5/10 Median: 7/10 (06/24/2010) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** A comprehensive reflection is provided at the end of the final outcome.	**Enhancement:** A comprehensive action plan is provided at the end of the final outcome. (04/02/2013)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	law for this reaction. b. When the [NO] in reaction 2 is doubled, the rate doubles. Write the rate law for this reaction. c. In reaction 1, the initial [NO2] is twice the initial [CO]. What is the ratio of the initial rate of reaction to the rate at 50% completion? **Target for Success:** 70% (which is higher than the national average success rate as reported by the American Chemical Society)		
CHEM1B_SLO_3 - Apply principles of chemical equilibrium to chemical reactions. **SLO Status:** Active_Pending_Revision	**Exam - Course Test/Quiz -** Consider the decomposition of phosphorous pentachloride: PCl5(g) PCl3(g) + Cl2(g) KC = 1.80 at 250° C a. If 0.300 M PCl5 is placed in a 500-ml container at 250°C, what are the equilibrium concentrations of PCl5, PCl3, and Cl2? b. Suppose to the above mixture at equilibrium, you add 0.100 moles of Cl2(g) (inside the 500-ml container), what are the new equilibrium concentrations of PCl5, PCl3, and Cl2? **Target for Success:** 70% (which is higher than the national average	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Section 1 Section 2 Average: 8.2/10 Average: 8/10 Standard Deviation: 2.8/10 Standard Deviation: 3/10 Median: 10/10 Median: 10/10 (06/25/2010) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** A comprehensive reflection is provided at the end of the final outcome.	**Enhancement:** A comprehensive action plan is provided at the end of the final outcome. (04/02/2013)
		Program Review Reporting Year: 2012-2013 **Target :** Target Met Section 1 Section 2 Average: 8.2/10 Average: 8/10 Standard Deviation: 2.8/10 Standard Deviation: 3/10 Median: 10/10 Median: 10/10	**Enhancement:** A comprehensive action plan is provided at the end of the final outcome. (04/02/2013)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	success rate reported by the American Chemical Society)	(06/24/2010) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** A comprehensive reflection statement is provided at the end of the final outcome.	
CHEM1B_SLO_4 - Apply the second and third laws of thermodynamics to chemical reactions. **SLO Status:** Active_Pending_Revision	**Exam - Course Test/Quiz -** 1. Given the following two equations: ?G° = ?H° – T?S° and ?G° = -RTlnK; and assumption that ?H° and ?S° are constants over a wide range of temperatures (all the symbols have the usual meanings). If K1 is the equilibrium constant at a temperature T1 and K2 is the equilibrium constant at a temperature T2, show that: 2. What is the standard molar entropy (in) of condensation of water at 100°C? A useful generalization known as Troutan's rule states that for many liquids at their normal boiling points, the standards molar entropy of vaporization has a value of about 87 J-mol-1K-1. The enthalpy of vaporization of water is 40.67 kJ/mol. a. Given that water vaporizes at 100°C, what is the value for the standard molar entropy of vaporization for water? b. According to Troutan's rule: for many liquids at their normal boiling points, the standard molar entropy of vaporization is about 87 J-mol-1K-1? Does the value calculated in part (a) agree with	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Section 1 Section 2 Average: 7.6/10 Average: 7.7/10 Standard Deviation: 3.3/10 Standard Deviation: 2.7/10 Median: 10/10 Median: 9/10 (06/25/2010) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The national success rate in chemistry (based on data from nsf.gov and acs.org) is between 65-70%. The assessment data of the outcomes for this chemistry class indicates that the performance of De Anza College chemistry students is above the national average. Based on the two sections that were assessed, we noted that the success rate of students meeting or exceeding the national average is greater in this class than in Chem 1A, the pre-requisite for this class. The minimum performance standard that students are expected to meet in order to be admitted to Chem 1B is a C in Chem 1A. It seems that students meeting this standard are adequately prepared to tackle the challenges of this class. It was also interesting to note that, this particular class has an exceptionally well-developed laboratory program, which is perfectly aligned with the lecture. Even though the various outcomes were assessed in lecture, our contention is that the experimental demonstration of the lecture objectives through processes of self-discovery in the laboratory provides for a much stronger understanding and retention of the theories discussed in the lecture. In the next round of assessment, we will evaluate the outcomes in	**Enhancement:** In the next round of assessment, we will evaluate the outcomes in the laboratory program. This class also serves as a model for the kinds of developmental activities that we should engage in, in our other chemistry classes. (04/02/2013)

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
	Troutan's rule. Explain why or why not. **Target for Success:** 70% (which is higher than the national average success rate reported by the American Chemical Society) **Exam - Course Test/Quiz -** 1. Given thermodynamic values form a standard table, and the equations deltaG0 = deltaH0 -TdeltaS0: calculate standard change in ent	the laboratory program.	
CHEM1B_SLO_5 - Solve problems related to chemical equilibrium. **SLO Status:** COR_Update_Necessary **Planned Assessment Quarters:** 2016-17 3-Winter **Outcome Creation Date:** 10/02/2015	**Exam - Course Test/Quiz -** Mid term exam related to equilibrium **Target for Success:** 70%	**Program Review Reporting Year:** 2016-2017 **Target :** Target Not Met 69.5% % average score on the second mid term exam administered in sections 03/04 of Chris Deming's class. (03/25/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** CHEM 1 ABC is a year long general chemistry sequence. A combined reflection statement is noted for all the SLOs in these classes at the end of CHEM 1C.	
CHEM1B_SLO_6 - Demonstrate an understanding of the fundamental principles of kinetics, equilibrium, and thermodynamics by performing appropriate laboratory experiments. **SLO Status:** COR_Update_Necessary **Planned Assessment Quarters:** 2016-17 3-Winter **Outcome Creation Date:** 03/25/2017	**Laboratory Project -** Lab final exam **Target for Success:** 70%	**Program Review Reporting Year:** 2016-2017 **Target :** Target Not Met 68% average score in the lab report containing the synthetic procedures, related calculations, and explanations for the accuracy of the results based on the student's personal experience with the experiment. Administered by Chris Deming in sections 03/04 in Winter 2017. (03/25/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** CHEM 1 ABC is a year long general chemistry sequence. A combined reflection statement is noted for all the SLOs in these classes at the end of CHEM 1C.	

CHEM 1C:General Chemistry and Qualitative Analysis

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
CHEM1C_SLO_1 - Apply the principles of equilibrium and thermodynamics to electrochemical systems. **SLO Status:** Active_Pending_Revision	**Exam - Course Test/Quiz -** The solubility product constant (KSP) for Pd(OH)2 is 3.0 × 10-28. Given that the standard reduction potential for Pd2+/Pd is 0.915 V. Calculate the standard reduction potential for the following: Pd(OH)2(S) + 2e ? Pd(S) + 2OH-(aq **Target for Success:** 70% (which is higher than the national average success reported by the American Chemical Society)	**Program Review Reporting Year:** 2012-2013 **Target :** Target Not Met Section 1 Section 2 Mean 5.3 5.7 Standard Deviation 4.1 4.1 Median 5 5 (03/28/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students are not successfully learning this outcome. The outcome assessed here has to do with several concepts, some of which are discussed in the previous class of this sequence. Although, a review of those topics is included in this class, the complexity of those topics provided justification to spend more time on those topics.	**Enhancement:** The department will examine a realignment of topics in the entire general chemistry sequence to provide more time for discussions of more complex topics. (04/02/2013)
CHEM1C_SLO_2 - Apply the principles of transition metail chemistry to predict outcomes of chemical reactions and physical properties. **SLO Status:** Active_Pending_Revision	**Exam - Course Test/Quiz -** Back in 1895, before the days of systematic nomenclature from IUPAC of coordination compounds, a student synthesized three chromium coordination compounds all of which had the same formula CrCl3(H2O)6. Further analysis of the three compounds showed the following properties: Color Chloride ions in solution (not part of the complex) Compound 1 Violet 3 Compound 2 Light Green 2 Compound 3 Dark Green 1 Keeping in mind that chromium forms octahedral complexes, answer	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Section 1 Section 2 Mean 6.0 7.0 Standard Deviation 2.9 2.8 Median 6 8 (03/28/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The data here indicates that students are only learning this outcome to a modest extent. In order to provide a more in-depth understanding of this topics, perhaps a related laboratory experiment must be included which can illustrate some of the principles discussed in the lecture.	**Enhancement:** The department will consider incorporating laboratory topics to illustrate the principles being discussed here. Future assessments could probably be conducted in the laboratory. (04/02/2013)

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
	the following questions: a. Give the correct formulas of the three compounds and also their names. b. Which, if any, of the three compounds will have geometric isomers? Draw the geometric isomers of this compound. c. Will the central metal ion in each compound have a high spin or low spin electron configuration? Draw an orbital diagram to illustrate your answer. d. Which of the three compounds will be paramagnetic and which will be diamagnetic? e. Suggest a simple experiment to confirm the number of chloride ions present in solution in each of the compounds. **Target for Success:** 70% (which is higher than the national average success reported by the American Chemical Society)		
CHEM1C_SLO_3 - Evaluate isotopic decay pathways. **SLO Status:** Active_Pending_Revision	**Exam - Course Test/Quiz -** A volcanic eruption melts a large chunk of rock, and all the gases are expelled. After cooling, 40Ar accumulates from the ongoing decay of 40K in the rock. Half life of 40K is 1.25 × 109 yr. When a piece of rock is analyzed, it is found to contain 1.38 mmol (millimoles) of 40K and 1.14 mmol of 40Are. How long ago did the rock cool? **Target for Success:** 70% (which is higher than the national average	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Section 1 Section 2 Mean 8.7 8.5 Standard Deviation 2.2 2.7 Median 10 10 (03/28/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The students are definitely learning this topic and understanding the ideas and concepts well.	**Enhancement:** At this time no major action plan is recommended. (04/02/2013)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	success reported by the American Chemical Society)		
CHEM1C_SLO_4 - Combine principles of equilibrium and thermodynamics and solve problems related to electrochemical systems. **SLO Status:** COR_Update_Necessary **Planned Assessment Quarters:** 2015-16 4-Spring **Outcome Creation Date:** 10/02/2015	**Exam - Course Test/Quiz -** Mid term exam **Target for Success:** 70%	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met 79% average score (03/25/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** CHEM 1ABC is a year long general chemistry sequence. A combined reflection statement is noted for all the SLOs in these classes at the end of CHEM 1C.	
CHEM1C_SLO_5 - Analyze unknown inorganic salts qualitatively and identify the cations and anions present in them. **SLO Status:** COR_Update_Necessary **Planned Assessment Quarters:** 2015-16 4-Spring **Outcome Creation Date:** 10/02/2015	**Laboratory Project -** Lab report for analysis of cations and anions. **Target for Success:** 70%	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met 80% average score on lab practical exam for cations. (03/25/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** General Chemistry is a year long sequence comprised of three classes each of which has a lecture and a laboratory component. The SLOs in these classes were generally divided into two parts- one testing learning outcomes in the lecture and other testing learning outcomes in the laboratory. Based on the assessment of the lecture outcome, we have learned that the students are having a difficult time with the recently adopted free textbook from OpenStax. As a result the department is negotiating with publishers of conventional textbooks to obtain a low-cost deal for the students. We also learned that students understood lecture topics better when there was a closely related laboratory experiment. Most of the laboratory exercises in these classes work adequately. However, there are some that require significant overhauling. The department plans to work on this in the coming year. Laboratory overhaul is both labor intensive and capital intensive. To this end, the department is requesting funds to support this process. The funds will be utilized for 1) purchasing equipment that will be used in	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		experiments 2) purchasing new chemicals 3) updating some of the older equipment with more modern substitutes. Finally, the department would like to emphasize that due to the heavy reliance on the laboratory program in all our curriculum, it is not only important to have adequate financial resources for equipment and supplies for the laboratory, but also an additional full time staff person to manage the day to day laboratory operations. This will enable us to add more sections of these high demand classes (each of which have full waiting lists in all their sections) and ultimately increase enrollment significantly which will be a benefit to 1) students 2) the chemistry department 3) the college and 4) the district.	
CHEM1C_SLO_6 - Demonstrate a knowledge of intermolecular forces. **SLO Status:** Active_Pending_Revision **Outcome Creation Date:** 02/10/2018			

CHEM 25:Preparation Course for General Chemistry

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
CHEM50_SLO_1 - Assess the fundamental concepts of modern atomic and molecular theory. **SLO Status:** Active	**Exam - Course Test/Quiz -** 3. How many neutrons are in the nucleus of an atom of 6027 Co? 34. What is the molecular shape of NH¬3? **Target for Success:** 70% (which is higher than the national average success rate reported by the American Chemical Society).	**Program Review Reporting Year:** 2012-2013 **Target :** Target Not Met #3) Number of Responses: 37 Number of Correct: 19 Number of Incorrect:18 Average % Correct: 51.4% #34) Number of Responses: 37 Number of Correct: 25 Number of Incorrect:12 Average % Correct: 67.6% (06/24/2010) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** A detailed reflection is provided at the end of the final outcome.	**Enhancement:** A detailed action plan is provided at the end of final outcome. (04/02/2013)
CHEM50_SLO_2 - Evaluate the standard classes of chemical reactions. **SLO Status:** Active	**Exam - Course Test/Quiz -** 15. What are the predicted products from the following neutralization reaction? 16. What is the formula of the predicted product from heating magnesium metal and nitrogen gas? **Target for Success:** 70% (which is higher than the national average success rate reported by the American Chemical Society).	**Program Review Reporting Year:** 2012-2013 **Target :** Target Not Met 15) Number of Responses: 37 Number of Correct: 21 Number of Incorrect:16 Average % Correct: 56.8% 16) Number of Responses: 37 Number of Correct: 34 Number of Incorrect: 3 Average % Correct: 91.9 % (06/25/2010) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** A detailed reflection is provided at the end of the final outcome.	**Enhancement:** A detailed action plan is provided at the end of final outcome. (04/02/2013)
CHEM50_SLO_3 - Demonstrate a fundamental understanding of mathematical concepts pertaining to chemical experimentation and calculations. **SLO Status:** Active	**Exam - Course Test/Quiz -** 28. How many moles of helium occupy a volume of 5.00L at 227.0ºC and 5.00 atm? 48. If 37.5 mL of 0.100 M calcium chloride reacts completely with aqueous silver nitrate, what is the mass of AgCl (143.32g/mol) precipitate?	**Program Review Reporting Year:** 2012-2013 **Target :** Target Not Met 28. Number of Responses: 37 Number of Correct: 16 Number of Incorrect: 21 Average % Correct: 43.2 % 48. Number of Responses: 37 Number of Correct: 28	**Enhancement:** The proposals in the reflection statement will require considerable additional resources, which we currently lack. While the tutorial center provides students with an opportunity for drop-in tutoring; the number of tutors available is a

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	Target for Success: 70% (which is higher than the national average success rate reported by the American Chemical Society).	Number of Incorrect: 9 Average % Correct: 75.7% (06/25/2010) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The national success rate in chemistry (based on data from nsf.gov and acs.org) is between 65-70%. The assessment data of the outcomes for this chemistry class indicates that the performance of De Anza College chemistry students is at or above the national average. While this is encouraging, we feel that there is scope for further improvement. Since this is a “preparation” class for General Chemistry course sequence, our experience has been that, those students who simply meet the minimum required performance standards in this class are having difficulties in the General Chemistry sequence. The primary methods by which we can elevate student performance to far above average standards would be: 1) by providing students greater support via tutorials/recitations and education about study skills; and 2) by providing students a better laboratory experience by tying in the lab experiences more closely with the lecture.	small number compared to the total number of students enrolled in this class. Additionally, the tutorial center is not equipped to provide students with guidance regarding study skills, or strategies for being successful in chemistry (and sciences in general). Based on our assessment of a different chemistry class (Chem 1B) in which the lecture and laboratory are extremely well coordinated, we concluded that laboratory experiences that closely parallel material discussed in the lecture is essential for students to be successful in chemistry. The limiting factor in having a highly challenging and exceptional laboratory program is primarily due to limitations in resources. Specifically, the staffing situation in our laboratories is sub-par; we have one staff member undertaking the responsibilities of three entirely different positions (stockroom manager, hazardous waste manager, laboratory coordinator). Changes to our laboratory curriculum involve a great deal of planning: developing new laboratory experiments, ordering required chemicals and other supplies, writing a new laboratory manual, creating waste labels, organizing different necessary equipment, training student workers in appropriate laboratory preparations, just to

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
			name a few. All of these tasks require large investments of time from both the faculty and the single stockroom full-time personnel. While the faculty may be able to develop new and interesting laboratory experiments, it is impossible to implement these without complete synergy with the (lone) stockroom personnel. Students will greatly benefit from a richer laboratory experience, and this is likely to lead to a much improved accomplishment and success of the learning outcomes. However, due to limitations in resources such projects are currently purely theoretical concepts. (04/02/2013)

CHEM 30A:Introduction to General, Organic and Biochemistry I

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
CHEM30A_SLO_1 - Solve stoichiometric problems by applying appropriate molar relationships. **SLO Status:** Archived SLO Statement	**Exam - Course Test/Quiz -** 8. (10 points) In the following reaction between sulfuric acid and sodium hydroxide, 12.5 ml of sodium hydroxide are needed to react completely with 37.5 ml of 0.200 M sulfuric acid. What is the concentration (molarity) of the sodium hydroxide? 2NaOH + H2SO4 ? Na2SO4 + 2H 9. (10 points) How many ml of 3.00 M HCl are needed to completely react with 4.85 grams of calcium carbonate according to the following reaction? CaCO3 + 2HCl ? CaCl2 + H2CO3 10. (10 points) How many ml of 0.500 M magnesium nitrate are needed to react with 10.0 ml of 0.250 M potassium phosphate according to the following UNBALANCED reaction? (you will need to balance the equation prior to solving the problem) Mg(NO3)2 + K3PO4 ? Mg3(PO4)2 + KNO3 **Target for Success:** 70% (higher than the average success rate reported by the American Chemical Society)	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Average score: 70/100 Standard Deviation: 21/100 Median: 75/100 Success rate: 70% (03/25/2011) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** A detailed summary of the reflection is at the end of the final outcome.	**Enhancement:** A detailed action plan is at the end of the final outcome. (04/02/2013)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
CHEM30A_SLO_2 - Predict the behavior of ideal gasses using Kinetic Molecular Theory. **SLO Status:** Archived SLO Statement	**Exam - Course Test/Quiz -** 1. Which of the following is a unit of pressure equal to 1 mm Hg? (a) 1 atm (b) 1 kPa (c) 1 psi (d) 1 torr (e) none of the above 2. What is the term for a gas at 273 K and 760 mm Hg pressure? (a) atmospheric temperature and pressure (b) experimental temperature and pressure (c) ideal gas temperature and pressure (d) standard temperature and pressure (e) none of the above 3. If a gas pressure gauge reads 15 mm Hg, what is the pressure in atmospheres? (a) 0.020 atm (b) 0.20 atm (c) 15 atm (d) 1100 atm (e) 11,000	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Average score: 36/50 Standard Deviation: 8.3/50 Median: 36/50 Success rate: 72% (03/25/2011) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** A detailed reflection statement if at the end of the final outcome	**Enhancement:** A detailed action plan is at the end of the final outcome. (04/02/2013)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	atm 4. If a steel scuba tank contains compressed air at 2250 psi, what is the pressure expressed in atmospheres? (1atm = 14.7 psi) (a) 2.96 atm (b) 29.6 atm (c) 75.3 atm (d) 153 atm (e) 3.31 × 104 atm 5. Which of the following changes decreases the pressure of a gas? (a) increasing the volume (b) decreasing the temperature (c) decreasing the number of gas molecules (d) all of the above (e) none of the above		

6. A sample of argon gas at 520 mm Hg expands from 0.150 L to 0.300 L. If the temperature remains constant, what is the final pressure?
(a) 260 mm Hg
(b) 520 mm Hg
(c) 760 mm Hg
(d) 1040 mm Hg
(e) none of the above

7. If the pressure of 1.50 L of hydrogen gas at 100 °C decreases from 0.500 atm to 0.115 atm, what is the final volume? Assume temperature remains constant.
(a) 0.345 L
(b) 0.652 L
(c) 1.50 L
(d) 3.45 L
(e) 6.52 L

8. A 5.00 L volume of ethane gas is heated from 298 K to 596 K. If the pressure remains constant, what is the final volume?
(a) 2.50 L
(b) 4.58 L
(c) 5.00 L
(d) 5.46 L

(e) 10.0 L

9. If a volume of nitric oxide gas at 25.0 °C increases from 2.00 L to 3.00 L, what is the final Celsius temperature? Assume pressure remains constant.

(a) –74 °C
(b) 17 °C
(c) 38 °C
(d) 174 °C
(e) 199 °C

10. A sample of air at 7.50 atm is heated from 224 K to 448 K. If the volume remains constant, what is the final pressure?

(a) 4.57 atm
(b) 3.75 atm
(c) 6.15 atm
(d) 12.3 atm
(e) 15.0 atm

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*

11. The pressure of sulfur trioxide gas at 25 °C increases from 0.500 atm to 1.00 atm. What is the final Celsius temperature if the volume remains constant?

(a) –124 °C
(b) 149 °C
(c) 323 °C
(d) 422 °C
(e) 596 °C

12. If a 50.0 mL sample of xenon gas is at 0.921 atm and 27 °C, what is the volume of the gas at STP?

(a) 41.9 mL
(b) 49.4 mL
(c) 50.6 mL
(d) 54.9 mL
(e) 59.7 mL

13. A sample of laughing gas occupies 0.250 L at 14.7 psi and –80.0 °C. If the volume of the gas is 0.375 L at 25.0 °C, what is the pressure?

(a) 6.35

psi
(b) 14.3
psi
(c) 15.1
psi
(d) 31.4
psi
(e) 34.0
psi

14. An atmospheric sample contains nitrogen at 599 torr, oxygen at 154 torr, argon at 6 torr, and carbon dioxide. Assuming standard pressure, what is the partial pressure of carbon dioxide gas?
(a) 1 torr
(b) 6 torr
(c) 439
torr
(d) 759
torr
(e) 1519
torr

15. Which of the following states that the pressure and volume are inversely proportional for a gas at constant temperature?
(a) Boyle's
law
(b)
Charles's law
(c) Dalton'
s law
(d) Gay-
Lussac's law

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	(e) none of the above 16. Which of the following states that the volume and Kelvin temperature are directly proportional for a gas at constant pressure? (a) Boyle's law (b) Charles's law (c) Dalton's law (d) Gay-Lussac's law (e) none of the above 17. Which of the following states that the pressure exerted by a gas is inversely proportional to its volume and directly proportional to its Kelvin temperature? (a) Boyle's law (b) Charles's law (c) Gay-Lussac's law (d) combined gas law (e) none		

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	of the above 18. Which of the following states that the pressure exerted by a mixture of gases is equal to the sum of the individual gas pressures? (a) Boyle's law (b) Charles's law (c) Dalton's law (d) Gay-Lussac's law (e) none of the above **Target for Success:** 70% (higher than the average success rate reported by the American Chemical Society)		
CHEM30A_SLO_3 - Apply acid-base chemical principles to biological processes. **SLO Status:** Archived SLO Statement	**Exam - Course Test/Quiz -** 1) According to the Bronsted-Lowry definition, A) an acid is a proton acceptor. B) a base produces ions in aqueous solutions. C) a base is a proton donor. D) a base is a proton acceptor. E) an acid acts as the solvent. 2) Identify the Bronsted-Lowry acid in the following reaction. A)	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Average score: 39/50 Standard Deviation: 8/50 Median: 39/50 Success rate: 78% (03/25/2011) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The data from this assessment cycle showed us that students were learning the outcomes outlined for this class. Although the target success rate was met in all three outcomes, the performance could be further enhanced. This class is the first of a two-quarter sequence of introduction to general, organic, and biochemistry classes whose target student-group is those entering the allied health professions. The learning outcomes and the assessment tools employed for appropriate for this class and the results indicate a good success rate.	**Enhancement:** The success rate in this class could be enhanced by improving the lab curriculum. Following this assessment, the lab curriculum for these two classes are undergoing a major revision. The outcomes must be re-evaluated in two-three years to determine the effect of the revised curriculum. (04/02/2013)

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
	B) C) D) E) 3) The correct formula for sulfuric acid is A) . B) . C) . D) E) . 4) Which of the following statements correctly describes the hydronium-hydroxide balance in the given solution? A) In acids, [ ] is greater than [ ]. B) In bases, [ ] = [ ]. C) In neutral solutions, [ ] =[ ]. D) In bases, [ ] is greater than [ ]. E) In bases, [ ] is less than [ ]. 5) What is the [ ] in a solution with [ ] = ? A) B) C) D)		

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	E) 6) What is the [ ] in a solution that has a [ ] = ? A) B) C) D) E) 7) What is the pH of a solution with [ ] = ? A) B) -9.0 C) 5.0 D) -5.0 E) 9.0 8) What is the pH of a solution with [ ] = ? A) 10.0 B) -10.0 C) 4.0 D) -4.0 E) 9) A solution with [ ] of has a pH of ________.		

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	A) 2.3 B) -2.3 C) 11.7 D) 7.0 E) 5.0 10) The [ ] of a solution with pH = 9.7 is A) 9.7 M. B) . C) . D) . E) 11) An acid and base react to form a salt and water in a(n) ________ reaction. A) ionization B) dissociation C) oxidation D) neutralization E) reduction 12) Which of the following is the correctly balanced equation for the complete neutralization of with ?		

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	A) B) C) D) E) 13) The neutralization reaction between and produces the salt with the formula A) . B) . C) . D) . E) . 14) The function of a buffer is to A) change color at the end point of a titration. B) maintain the pH of a solution. C) be a strong base. D) maintain a neutral pH. E) act as a strong acid. 15) Which of the following is a buffer system? A) NaCl and B) HCl and NaOH C) and D) NaCl and NaOH E) and HCl		

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	16) 25.0 mL of 0.212 M NaOH is neutralized by 13.6 mL of an HCl solution. The molarity of the NaOH solution is A) 0.212 M. B) 0.115 M. C) 0.500 M. D) 0.390 M. E) 0.137 M. 17) A 10.0 mL of 0.121 M is neutralized by 17.1 mL of KOH solution. The molarity of the KOH solution is A) 0.207 M. B) 0.4141 M. C) 0.0708 M. D) 0.428 M. E) 0.142 M. **Target for Success:** 70% (higher than average success rate reported by the American Chemical Society)		
CHEM30A_SLO_4 - Solve stoichiometric problems pertaining to reactions between acids and bases. **SLO Status:** Active **Planned Assessment Quarters:** 2016-17 3-Winter **Outcome Creation Date:** 10/02/2015	**Exam - Course Test/Quiz -** Titration problem from final mid term exam. **Target for Success:** 70%	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met X (03/25/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** CHEM 30 AB is a sequence of two classes. A combined reflection statement is noted at the end of the SLO for 30B.	
CHEM30A_SLO_5 - Demonstrate an understanding of the scientific method by performing laboratory	**Laboratory Project -** Lab final exam **Target for Success:** 70%	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
experiments. **SLO Status:** Archived SLO Statement **Planned Assessment Quarters:** 2016-17 3-Winter **Outcome Creation Date:** 10/02/2015		72% average score in the lab final exam (03/25/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** CHEM 30 AB is a sequence of two classes. A combined reflection statement is noted at the end of the SLOs for 30B.	
CHEM30A__SLO_6 - Identify the differences between elements and compounds and describe the chemical bonding in compounds-ionics vs. covalent. **SLO Status:** Active **Outcome Creation Date:** 09/25/2017	**Exam - Course Test/Quiz -** Define the term electronegativity. Then, explain the difference between a covalent and an ionic bond and explain how electronegativity can be used to determine what kind bond will form between two atoms. **Target for Success:** 70%	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met 76% average score on exam problem (03/23/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The difference between ionic and covalent bonds is fundamental to understanding the difference in behavior between two major classes of substances: ionic and molecular. This difference in behavior affects both the chemical reactivity of different substances as well as their physical properties. Although the target was met, it is hoped that the success rate can be increased further, as an intuitive understanding how atoms bond reoccurs throughout the course.	

CHEM 30B:Introduction to General, Organic and Biochemistry II

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
CHEM30B_SLO_1 - Differentiate the general reactions of the principle organic functional groups. **SLO Status:** Active	**Exam - Course Test/Quiz -** QUIZ 1 of the winter 2011, sections 61 & 62 were used to assess this outcome. **Target for Success:** 70% (which is higher than the average success rate reported by the American Chemical Society).	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Average: 45/50 Standard Deviation: 4/50 Median: 47/50 Success % = 90% (06/24/2011) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Detailed reflection is provided at the end of the final outcome.	**Enhancement:** Detailed action plan is provided at the end of the final outcome. (04/02/2013)
CHEM30B_SLO_2 - Evaluate the major classes of biological compounds from a chemical perspective. **SLO Status:** Active	**Exam - Course Test/Quiz -** Quiz 5 (topic: proteins and amino acids) and Quiz 6 (topic: nucleic acids and DNA) of the spring quarter 2011 in sections 61 and 62 were used for the assessment. **Target for Success:** 70% (which is higher than the average success rate reported by the American Chemical Society)	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Quiz 5: Average: 37/50 Standard Deviation: 8/50 Median: 37/50 Success % = 80% Quiz 6: Average: 40/50 Standard Deviation: 7/50 Median: 41/50 Success % = 82% (06/24/2011) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** This is the second quarter of a sequence of two classes on the introduction of general, organic, and biochemistry to allied health students. The success rate of student learning in this second class is much higher than even the first class, even though it is the same group of students who are taking this class as well. Obviously, then the difference in success rates between the two classes (30A and 30B) is not due to the differences in the students. Also, since it was the same	**Enhancement:** To further improve the learning in these two classes, perhaps more emphasis must be placed in the lectures on applications related to the topics being discussed. As mentioned in the earlier action-plan (for CHEM 30A) a new laboratory manual is being developed for these two classes and the classes must then be re-assessed to evaluate the success of the new laboratory manual. (04/02/2013)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		instructor assessing the two classes, the differences are not attributed to the instructor either. The differences are most likely due to the topics covered in the two classes. The topics covered in the second class are more application oriented and directly relevant to the students chosen field of further study. This interests the students more and as a result their own learning is greatly enhanced.	
CHEM30B_SLO_3 - Analyze the structural features of various organic and biological molecules and identify them. **SLO Status:** Archived SLO Statement **Planned Assessment Quarters:** 2016-17 3-Winter **Outcome Creation Date:** 10/02/2015	**Exam - Course Test/Quiz -** Mid term exam **Target for Success:** 70%	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met X (03/25/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** CHEM 30 AB are a sequence of two classes. A combined reflection statement is provided at the end of the SLOs for 30B.	
CHEM30B_SLO_4 - Demonstrate an understanding of the reactivity of organic and biological molecules. **SLO Status:** Archived SLO Statement **Planned Assessment Quarters:** 2016-17 3-Winter **Outcome Creation Date:** 10/02/2015	**Laboratory Project -** Lab final exam **Target for Success:** 70%	**Program Review Reporting Year:** 2016-2017 **Target :** Target Met X (03/25/2017) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** CHEM 30A and 30B are required classes for allied health professionals. While the data reflect that the target for success is being met in both of these classes in all the learning outcomes, we are still constantly making changes to improve the learning outcomes in these classes. For instance, we are adopting a new text that is more in depth than the one used previously. Also we are going to be incorporating all new lab experiments in the 30A class. We will also be adopting new laboratory manuals for these classes. Even though it is not obvious from the assessment data, the reagents used in the 30B class are sub-par and need a major refreshing. Organic and biochemistry regents are considerable expensive and require a substantial cost investment to guarantee quality and reproducibility of the data. So, we will be requesting additional funding to support these laboratory classes.	

CHEM 77 (X-Y):Special Projects in Chemistry

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
CHEM77_SLO_1 - Demonstrate, via a culmination of the aims and methods specified in sections 3, 4, and 5 of the Special Projects contract, a mastery of the relevant overarching concepts. **SLO Status:** Active_Pending_Revision **Outcome Creation Date:** 02/11/2018			

Assessment: Course/Service Four Column

Dept - (PSME) Astronomy

ASTR 10:Stellar Astronomy

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
ASTR10_SLO_1 - Appraise the benefits to society of astronomical research concerning stars and stellar systems. **SLO Status:** Active	**Exam - Course Test/Quiz -** Multiple-choice questions. **Target for Success:** 65%	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met Midterm Exams, Astronomy 10, Spring 2013 (Cichanski): One question was related to this objective. 55 people took the test, of whom 37 answered the question correctly, for a success rate of 67%. (04/18/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** As with all the other data gathered in this first round of assessments, there is still more discussion going on about the data gathering itself than about what to do on the basis of the data. In particular, we need to find a way to be more uniform in our data gathering in the future in order not to be “comparing apples and oranges” and to establish a meaningful baseline. Two issues are particularly problematic for us in the data gathering we have done in this first round for both Astronomy 4 and Astronomy 10: different testing formats and different times during the quarter when assessments were done. Testing formats: The four of us who teach Astronomy courses use three different formats of “bubble sheet” exams. Two use conventional “one best answer” multiple choice exams. One (Dr. Cichanski) uses an innovative format in which some partial credit is given for certain not-optimum responses. The other (Mr. Harrington) uses a format in which students explicitly assess whether each answer in a single question group is right or wrong. We are	**Enhancement:** A more uniform protocol for gathering data will be formulated by the department, in which data will be gathered at the same time in the quarter (probably final exams) and differences in testing styles will be accommodated in a way that produces results that can legitimately be compared to one another. The latter will be helped significantly when and if functioning software is installed for the PSM&E Division’s new Insight 4es test sheet scanner from Scantron. (04/18/2014)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		having lively discussions about how to compare our scores in a meaningful way while preserving our individual testing methods. Times of assessment: The Astronomy 10 assessments were conducted on midterm exams, in which students were being tested on the material for the first time. The Astronomy 4 assessments were conducted on a comprehensive final exam, so students were being tested on most of the material for at least a second time. Scores on the latter are likely to be higher than on the former, and that is borne out in the results. This will be an easier issue to fix in the future than the disparate test formats issue will be.	
ASTR10_SLO_2 - Evaluate the impact on Earth's characteristics of the evolution of stars and stellar systems. **SLO Status:** Active	**Exam - Course Test/Quiz -** Multiple-choice questions. **Target for Success:** 65%	**Program Review Reporting Year:** 2016-2017 **Target :** Target Not Met Assessment Data Summary, end of 2018-2019 Prepared by Marek Cichanski, Astronomy Dept. Coordinator To assess ASTR10_SLO_2, I chose a multiple-choice question from the third (of three) midterm exams from my Astronomy 10 class. Background Information: My multiple-choice questions typically have four choices, one of which (the best answer) gets full points. There is usually a second-best choice, which gets about 3/4 of the full points, and two "wrong answer" choices that get 1/2 of the full points. This partial-credit system accomplishes roughly the same thing as "curving" the grades, while still using a fixed grading scale, and thus avoids putting the students in direct competition with each other for grades. This SLO concerns stellar evolution, which is the set of changes that a star goes through during its lifetime. As stars consume the fuel in their cores (typically hydrogen during most of their lifetime), they undergo changes. These changes can affect the planets orbiting those stars, particularly if the star becomes brighter, for example. This can affect the temperatures of the planets. When the Sun consumes all of the available hydrogen in its core, for	**Enhancement:** They type of knowledge that students were asked to demonstrate in this question might well be reinforced by some type of in-class question, such as on a "lecture-tutorial" worksheet or with the use of an anonymous in-class voting system. (06/30/2019)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		example, it will become much larger and brighter for a while, even though that might seem counter-intuitive. The question that I chose to assess for this SLO concerned the fundamentals of this process. It asked the students: As a star fuses hydrogen into helium, what outward changes are noticeable in the star? The best answer was that the star will become larger and brighter. This question had two "second best" answers, each of which contained one (but not both) of those words. The one wrong answer choice said "smaller and dimmer". 52% of students chose the best answer, with 36% choosing one or the other of the "second-best" answers. 12% chose the wrong answer. (06/30/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** It is interesting that 88% of the students picked an answer choice that had at least of the correct words ("bigger" and/or "brighter") in it. To me, this seems to suggest that the majority of the students had at least some understanding of how this fundamental aspect of stellar evolution proceeds.	
		Program Review Reporting Year: 2016-2017 **Target :** Target Not Met A question from a multiple-choice test was assessed. This question came from the final exam for the 7:30am Astronomy 10 class in Winter 2017. Of the 26 students taking the exam, 58% of them selected the correct answer to a question about the Sun's main-sequence lifetime, compared to a star with 15 times the Sun's mass. (03/20/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** In early planning for the SLO assessment process, the Astronomy department laid out a goal of 65% as a target for success in this type of SLO assessment (multiple-choice exam questions). In this case, the success rate on this question was several percentage points below the goal. There may be several reasons for this. One primary reason may be related to the more difficult nature of most of the material in Astronomy 10, as compared to Astronomy 4. Most	**Enhancement:** As of Winter 2019, when this assessment (from the 2016-2017 school year) was entered into TracDat, the Astronomy department has historically graded students in Astronomy 10 by means of a small number of exams. Typically, students are graded on the basis of 2 or 3 midterm exams and a final exam. One possible way of improving student performance on answers to objective-type test questions would be to divide the quarter's assessments into a smaller number of quizzes, and/or to conduct formative assessments on a regular basis. These more-

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		students who take Astronomy at De Anza College take Astronomy 4 (Solar System Astronomy). The course in question here, Astronomy 10 (Stellar Astronomy), involves a greater understanding of concepts from physics, due to the astrophysics-centered nature of the subject material. Like Astronomy 4, though, Astronomy 10 has no prerequisites in mathematics, physics, or chemistry, in order to provide non-science-major students the chance to fulfill their physical-science requirements while learning about stars, galaxies, and the universe. This does, however, require instructors in Astronomy 10 to teach a number of concepts from physics in a conceptual, non-mathematical way along with the astronomical facts and concepts in the course.	frequent formative assessments / practice questions could be assessed during most of the class periods by means of anonymous in-class voting systems. (03/20/2019)
		Program Review Reporting Year: 2013-2014 **Target :** Target Not Met Midterm Exams, Astronomy 10, Spring 2013 (Cichanski): One question was related to this objective. 49 people took the test, of whom 31 answered the question correctly, for a success rate of 63%. (04/18/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** As with all the other data gathered in this first round of assessments, there is still more discussion going on about the data gathering itself than about what to do on the basis of the data. In particular, we need to find a way to be more uniform in our data gathering in the future in order not to be "comparing apples and oranges" and to establish a meaningful baseline. Two issues are particularly problematic for us in the data gathering we have done in this first round for both Astronomy 4 and Astronomy 10: different testing formats and different times during the quarter when assessments were done. Testing formats: The four of us who teach Astronomy courses use three different formats of "bubble sheet" exams. Two use conventional "one best answer" multiple choice exams. One (Dr. Cichanski) uses an innovative format in which some partial credit is given for certain not-optimum responses. The other (Mr. Harrington) uses a	**Enhancement:** That this one question on one midterm missed the target for success by 2% is not of concern, primarily because it is in line with the percentage of success with all the other questions on similar exam questions in this instructor's testing format for midterms and the final success rates in courses for this instructor are not significantly different from everyone else in the department. The percentage success on this question is a manifestation more of a difference in testing style than a difference in teaching/learning effectiveness. A more uniform protocol for gathering data will be formulated by the department, in which data will be gathered at the same time in the quarter (probably final exams) and differences in testing

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		format in which students explicitly assess whether each answer in a single question group is right or wrong. We are having lively discussions about how to compare our scores in a meaningful way while preserving our individual testing methods. Times of assessment: The Astronomy 10 assessments were conducted on midterm exams, in which students were being tested on the material for the first time. The Astronomy 4 assessments were conducted on a comprehensive final exam, so students were being tested on most of the material for at least a second time. Scores on the latter are likely to be higher than on the former, and that is borne out in the results. This will be an easier issue to fix in the future than the disparate test formats issue will be.	styles will be accommodated in a way that produces results that can legitimately be compared to one another. The latter will be helped significantly when and if functioning software is installed for the PSM&E Division's new Insight 4es test sheet scanner from Scantron. (04/18/2014)
	Exam - Course Test/Quiz - Analysis of responses to exam questions that directly relate to this objective. **Target for Success:** 50%		
ASTR10_SLO_3 - Evaluate astronomical news items or theories about stellar astronomy based upon the scientific method. **SLO Status:** Active	**Exam - Course Test/Quiz -** Multiple-choice questions. **Target for Success:** 65%	**Program Review Reporting Year:** 2016-2017 **Target :** Target Not Met Assessment Data Summary, end of 2018-2019 Prepared by Marek Cichanski, Astronomy Dept. Coordinator To assess ASTR4_SLO_3, I chose a multiple-choice question from the final exam from my Astronomy 10 class. Background Information: My multiple-choice questions typically have four choices, one of which (the best answer) gets full points. There is usually a second-best choice, which gets about 3/4 of the full points, and two "wrong answer" choices that get 1/2 of the full points. This partial-credit system accomplishes roughly the same thing as "curving" the grades, while still using a fixed grading scale, and thus avoids putting the students in direct competition with each other for grades. This SLO is concerned with evaluating theories, and this is at the core of the scientific method. The question I chose to	**Enhancement:** Questions like this one may be a good example of where further time may be worth putting in to the explanation of general relativity. For example, if students see more examples of images of gravitational lensing, along with animations showing the 3-D layout of how the lensing works (such as those created by the European Southern Observatory for their ESOCast videos), they might be more likely to recognize an image like this one. Having done that, they might associate the correct explanation with the image. (06/30/2019)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		assess was about observational evidence for dark matter in clusters of galaxies. A scientist in the 1930s first noticed that the galaxies in clusters were moving too quickly (as they orbit the centers-of-mass of the clusters) for this to be explainable by the visible matter in the galaxies. They postulated the existence of an invisible form of matter called dark matter (DM). The dark matter makes the clusters so massive that they can bend light, and some galaxy clusters appear surrounded by distorted, arc-like images of background galaxies. This effect is called "gravitational lensing", and is an important form of evidence that supports the DM discovery from the 1930s. Students were shown an image of a galaxy cluster with "lensed arcs", taken by the Hubble Space Telescope. They were asked how this image gives evidence of DM in galaxy clusters. 33% of students chose the best answer (the lensed arcs), and 11% chose the second-best answer (DM is concentrated at the centers of the galaxies themselves, which is an oblique reference to the true fact that many galaxies have supermassive black holes at their centers. These black holes are not the DM, however.) 44% of students chose one of the wrong answers. (06/30/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The low percentage of students choosing the correct answer is not entirely surprising, given that the topic at hand concerns some of the more advanced topics in astrophysics, namely dark matter and Einstein's general theory of relativity. This points up one of the greatest fundamental challenges in a class like Astronomy 10, namely that it is basically a course in astrophysics, but which cannot have prerequisites in physics or math. This necessitates considerable time being spent on teaching the relevant physics, such as an overview of general relativity and its implications, such as gravitational lensing.	
		Program Review Reporting Year: 2013-2014 **Target :** Target Met Midterm Exams, Astronomy 10, Spring 2013 (Cichanski): One question was related to this objective. 55 people took the test, of whom 39 answered the question correctly, for a	**Enhancement:** A more uniform protocol for gathering data will be formulated by the department, in which data will be gathered at the same time in the quarter

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		success rate of 71%. (04/18/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** As with all the other data gathered in this first round of assessments, there is still more discussion going on about the data gathering itself than about what to do on the basis of the data. In particular, we need to find a way to be more uniform in our data gathering in the future in order not to be “comparing apples and oranges” and to establish a meaningful baseline. Two issues are particularly problematic for us in the data gathering we have done in this first round for both Astronomy 4 and Astronomy 10: different testing formats and different times during the quarter when assessments were done. Testing formats: The four of us who teach Astronomy courses use three different formats of “bubble sheet” exams. Two use conventional “one best answer” multiple choice exams. One (Dr. Cichanski) uses an innovative format in which some partial credit is given for certain not-optimum responses. The other (Mr. Harrington) uses a format in which students explicitly assess whether each answer in a single question group is right or wrong. We are having lively discussions about how to compare our scores in a meaningful way while preserving our individual testing methods. Times of assessment: The Astronomy 10 assessments were conducted on midterm exams, in which students were being tested on the material for the first time. The Astronomy 4 assessments were conducted on a comprehensive final exam, so students were being tested on most of the material for at least a second time. Scores on the latter are likely to be higher than on the former, and that is borne out in the results. This will be an easier issue to fix in the future than the disparate test formats issue will be.	(probably final exams) and differences in testing styles will be accommodated in a way that produces results that can legitimately be compared to one another. The latter will be helped significantly when and if functioning software is installed for the PSM&E Division’s new Insight 4es test sheet scanner from Scantron. (04/18/2014)

ASTR 15L:Astronomy Laboratory

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
ASTR15L_SLO_1 - Evaluate claims about the nature of the physical universe using the scientific method of hypothesis testing. **SLO Status:** Active **Outcome Creation Date:** 09/11/2013	**Exam - Course Test/Quiz -** Multiple-choice questions. **Target for Success:** 65%	**Program Review Reporting Year:** 2018-2019 **Target :** Target Not Met Assessment Data Summary, end of 2018-2019 Prepared by Marek Cichanski, Astronomy Dept. Coordinator To assess ASTR15L_SLO_1, I chose a multiple-choice question from the final exam from my Astronomy 15 lab class. Background Information: My multiple-choice questions typically have four choices, one of which (the best answer) gets full points. There is usually a second-best choice, which gets about 3/4 of the full points, and two "wrong answer" choices that get 1/2 of the full points. This partial-credit system accomplishes roughly the same thing as "curving" the grades, while still using a fixed grading scale, and thus avoids putting the students in direct competition with each other for grades. This SLO concerns evaluation of claims about the nature of the physical universe, i.e. hypothesis testing. An example of where this can be done is in considering the phases of the Moon. One of the labs is concerned with moon phases. Introductory portions of this lab exercise present the accepted model of how the Moon orbits the Earth, and how this affects the phase that the Moon displays to us observers on Earth. One simple way that a person could test this model is to postulate the Moon showing a particular phase, and then asking what phase it would show some time later. The question I chose to assess this SLO asked the students which phase the Moon would show 1 week after New Moon. 49% of students chose the best answer (the First Quarter phase), and another 49% of students chose the second-best answer (a thin crescent). Only 2% of students chose one of the wrong answers. (06/30/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** This was a very interesting assessment result. Nearly the entire class chose one of the two best answers, although only half of	**Enhancement:** Changing the wording of this question and/or its answer choices might be a worthwhile experiment in this case. If essentially the same question could be asked a different way, it would be interesting to see if a significant change in the percentage of correct answers would occur. (06/30/2019)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		them chose the single best answer. Looking at the results and the answer choices, it is possible that ambiguity may have played a role here. New Moon occurs when the Moon is not visible in the nighttime sky, appearing near the Sun, and thus being invisible to us here on Earth, lost in the blue daytime sky. After New Moon, the Moon appears as a thin crescent, eventually appearing half lit-up about a week after New Moon. This is the First Quarter phase. Students might have thought "The Moon goes through a crescent appearance in the days after New Moon, so it is possible that if it's ABOUT one week after New Moon, it still might appear crescent in some way".	
		Program Review Reporting Year: 2017-2018 **Target :** Target Not Met For this SLO assessment, a question from the ASTR 15 lab final (a multiple-choice exam) was assessed. The question asked "Why would it be strange to see the Sun at the sky's North Celestial Pole?" This question required students to evaluate the likelihood of a particular configuration of objects in the sky, and this type of thinking is integral to the process of hypothesis testing. In the Spring 2018 class, 61% of the students chose the correct answer for this question. (03/20/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The number of students successfully answering the question was a few percentage points below the overall target for success that was established by the Astronomy department in its initial planning for the SLO assessment process.	**Enhancement:** For this assessment, an exam question was used, but the course in question (ASTR 15L Astronomy laboratory) is primarily graded by having students turn in laboratory reports at the end of each class session. It might be more useful, for future assessments of SLOs in ASTR 4, to select questions from the lab handouts, which the students answer after performing collaborative work, in conjunction with their fellow students and with the opportunity to ask their instructor questions in class. (03/20/2019)
		Program Review Reporting Year: 2013-2014 **Target :** Target Met One question on the final exam in both Fall, 2013, and Winter, 2014 (identical question in both quarters) addressed this objective. 38 people total took those exams, of whom 27 answered this question correctly for a success rate of 71% (04/18/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The new lab course appears to be satisfying this objective, but it needs to be monitored for several more quarters before a	**Enhancement:** Data will continue to be gathered as more sections of this new course are taught. At present, the data are too sparse to base any significant changes on. (04/18/2014)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		statistically significant number of students have been tested.	
ASTR15L_SLO_2 - Compare and contrast the histories of solar-system bodies (e.g. moons, planets, asteroids, comets, meteorites) by integrating data from spacecraft and Earth-based observatories. **SLO Status:** Active **Outcome Creation Date:** 09/11/2013	**Exam - Course Test/Quiz -** Multiple-choice questions **Target for Success:** 65%	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met Assessment Data Summary, end of 2018-2019 Prepared by Marek Cichanski, Astronomy Dept. Coordinator To assess ASTR15L_SLO_2, I chose a multiple-choice question from the final exam from my Astronomy 15 lab class. Background Information: My multiple-choice questions typically have four choices, one of which (the best answer) gets full points. There is usually a second-best choice, which gets about 3/4 of the full points, and two "wrong answer" choices that get 1/2 of the full points. This partial-credit system accomplishes roughly the same thing as "curving" the grades, while still using a fixed grading scale, and thus avoids putting the students in direct competition with each other for grades. This SLO is concerned with solar system bodies of various types, such as planets. This can refer to the different planets in our solar system, or in solar systems other than the one we live in. (Solar systems around other stars have been discovered in abundance during the late 20th and early 21st centuries. The planets in these systems are called "exoplanets".) To assess this SLO, I chose a test question that started by reminding the students that most of the first exoplanets to be detected were "hot Jupiters". The question went on to ask them why planets of this type are relatively easy to detect. The correct answer said that these planets' large masses and close proximity to their stars allowed the planets to induce large radial-velocity "wobbles" in those stars' motions. 82% of students chose the correct answer, 8% chose the 2nd-best answer, and 10% chose one of the wrong answers. (06/30/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** A large majority of students chose the correct answer to this	**Enhancement:** With a result like this, it is important to avoid simply saying "It isn't broken, thus is doesn't need to be fixed". If, for example, the laboratory exercise on exoplanets were to be revised, it would be important to keep the core activities from the lab as it existed at this time. Most of all, the students were able to use computer simulations to see the effects that a planet's mass and distance from it star have on the star's "wobble". It would be important to retain these core "virtual experiments" in any revised version of this lab. (06/30/2019)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		question. It is interesting to ask whether specific factors could have contributed to this high level of success. One possibility could be that the topic had been covered in the second-to-last laboratory of the quarter, rather than early in the quarter. Another possible factor, although more general, could have been that a lab class has much more interaction between instructor and students, and between students while they work on their labs. The more interactive and collaborative nature of the class - in contrast to a lecture class - might have contributed to the relatively high success level.	
		Program Review Reporting Year: 2013-2014 **Target :** Target Met One lab final exam question addressed this objective in Fall, 2013. Of the 23 people who took the test, 18 answered this question correctly, for a success rate of 78%. (04/18/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The new lab course appears to be satisfying this objective, but it needs to be monitored for several more quarters before a statistically significant number of students have been tested.	**Enhancement:** Data will continue to be gathered as more sections of this new course are taught. At present, the data are too sparse to base any significant changes on. (04/18/2014)

ASTR 4:Solar System Astronomy

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
ASTR4_SLO_1 - Appraise the benefits to society of planetary research and exploration. **SLO Status:** Active	**Exam - Course Test/Quiz -** Objective-oriented multiple choice exam questions. **Target for Success:** 65% correct responses. **Comments/Notes:** 65% is the minimum passing score for a student.	**Program Review Reporting Year:** 2013-2014 **Target :** Target Met Final Exam, Astronomy 4.02, Winter 2014 (Harrington): Four questions were related to this objective. 120 students took the exam. Of the 480 responses to those questions, 455 were correct, for a success rate of 95%. (04/18/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** As with all the other data gathered in this first round of assessments, there is still more discussion going on about the data gathering itself than about what to do on the basis of the data. In particular, we need to find a way to be more uniform in our data gathering in the future in order not to be “comparing apples and oranges” and to establish a meaningful baseline. Two issues are particularly problematic for us in the data gathering we have done in this first round for both Astronomy 4 and Astronomy 10: different testing formats and different times during the quarter when assessments were done. Testing formats: The four of us who teach Astronomy courses use three different formats of “bubble sheet” exams. Two use conventional “one best answer” multiple choice exams. One (Dr. Cichanski) uses an innovative format in which some partial credit is given for certain not-optimum responses. The other (Mr. Harrington) uses a format in which students explicitly assess whether each answer in a single question group is right or wrong. We are having lively discussions about how to compare our scores in a meaningful way while preserving our individual testing methods. Times of assessment: The Astronomy 10 assessments were conducted on midterm exams, in which students were being tested on the material for the first time. The Astronomy 4 assessments were conducted on a comprehensive final exam, so students were being tested on most of the material for at least a second time. Scores on the latter are likely to be higher than on the former, and that is borne out in the results. This will be an easier issue	**Enhancement:** A more uniform protocol for gathering data will be formulated by the department, in which data will be gathered at the same time in the quarter (probably final exams) and differences in testing styles will be accommodated in a way that produces results that can legitimately be compared to one another. The latter will be helped significantly when and if functioning software is installed for the PSM&E Division’s new Insight 4es test sheet scanner from Scantron. (04/18/2014)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		to fix in the future than the disparate test formats issue will be.	
ASTR4_SLO_2 - Compare and contrast the development of planetary systems and of the major panet types, including those factors that have led to Earth's unique characteristics. **SLO Status:** Active	**Exam - Course Test/Quiz -** Objective-oriented multiple-choice questions. **Target for Success:** 65%	**Program Review Reporting Year:** 2018-2019 **Target :** Target Not Met Assessment Data Summary, end of 2018-2019 Prepared by Marek Cichanski, Astronomy Dept. Coordinator To assess ASTR4_SLO_2, I chose a multiple-choice question from the third (of three) midterm exams from my Astronomy 4 class. Background Information: My multiple-choice questions typically have four choices, one of which (the best answer) gets full points. There is usually a second-best choice, which gets about 3/4 of the full points, and two "wrong answer" choices that get 1/2 of the full points. This partial-credit system accomplishes roughly the same thing as "curving" the grades, while still using a fixed grading scale, and thus avoids putting the students in direct competition with each other for grades. To assess SLO 2, I chose a question about the Earth and Venus. In planetary science, Earth and Venus are often considered "near-twin" planets because of their similar sizes and masses. The temperatures at their surfaces, however, are very different, with the surface temperature on Venus being hotter than the melting points of aluminum and lead. The students were asked why these two planets have developed so differently, with such different surface conditions. The best answer to this question is that most of the Earth's carbon dioxide is locked up in rocks like limestone, whereas Venus's is almost all in its atmosphere, leading to a runaway greenhouse effect. The second-best answer describes Mars's atmosphere, without mentioning that planet by name. Mars, like Venus, has an atmosphere that is nearly all carbon dioxide, but is too thin to trap much heat, and consequently is very cold. 60% of the students chose the best answer, 18% chose the second-best answer, and 22% chose one of the wrong	**Enhancement:** Reflecting further on these results, it is possible that the role of rocks in storing the Earth's carbon dioxide might be worth describing in more detail. It might be worth illustrating this visually in lecture, such as with slides of ancient limestone deposits, and modern limestone-deposition environments (like the Bahamas) to emphasize how carbon dioxide is taken out of the Earth's atmosphere, but only because the Earth has liquid water on its surface. (06/30/2019)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		answers. (06/30/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Several quarters ago, the Astronomy department set a target of 65% correct responses as defining success. The responses to this question came close to that target.	
		Program Review Reporting Year: 2017-2018 **Target :** Target Met A multiple-choice question was assessed. This question came from the second (of 3) midterm exams given in Section 1 of ASTR 4 in Spring 2018. The question concerned the following topic: In our solar system, how can the planets be divided into two major categories? 74% of the 47 students taking the test answered the question correctly. (Inner planets: Rock and metal, Outer planets: hydrogen and helium gas and liquid) (03/20/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** In the Astronomy department's planning for SLO assessment, a target of 65% correct responses was established. The results of this question met the target. If an even higher percentage of students were to correctly answer a question like this (i.e. closely related to the SLO), that would be even better.	**Enhancement:** As of Winter 2019, when this assessment (from the 2017-2018 school year) was entered into TracDat, the Astronomy department has historically graded students in Astronomy 4 by means of a small number of exams. Typically, students are graded on the basis of 2 or 3 midterm exams and a final exam. One possible way of improving student performance on answers to objective-type test questions would be to divide the quarter's assessments into a smaller number of quizzes, and/or to conduct formative assessments on a regular basis. These more-frequent formative assessments / practice questions could be assessed during most of the class periods by means of anonymous in-class voting systems. (03/20/2019)
		Program Review Reporting Year: 2013-2014 **Target :** Target Met Final Exam, Astronomy 4.02, Winter 2014 (Harrington): Nine questions were related to this objective. 120 students took the exam. Of the 1,080 responses to those questions, 932 were correct, for a success rate of 86%. (04/18/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** As with all the other data gathered in this first round of assessments, there is still more discussion going on about the data gathering itself than about what to do on the basis of the	**Enhancement:** A more uniform protocol for gathering data will be formulated by the department, in which data will be gathered at the same time in the quarter (probably final exams) and differences in testing styles will be accommodated in a way that produces results that can legitimately be compared to one

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		data. In particular, we need to find a way to be more uniform in our data gathering in the future in order not to be "comparing apples and oranges" and to establish a meaningful baseline. Two issues are particularly problematic for us in the data gathering we have done in this first round for both Astronomy 4 and Astronomy 10: different testing formats and different times during the quarter when assessments were done. Testing formats: The four of us who teach Astronomy courses use three different formats of "bubble sheet" exams. Two use conventional "one best answer" multiple choice exams. One (Dr. Cichanski) uses an innovative format in which some partial credit is given for certain not-optimum responses. The other (Mr. Harrington) uses a format in which students explicitly assess whether each answer in a single question group is right or wrong. We are having lively discussions about how to compare our scores in a meaningful way while preserving our individual testing methods. Times of assessment: The Astronomy 10 assessments were conducted on midterm exams, in which students were being tested on the material for the first time. The Astronomy 4 assessments were conducted on a comprehensive final exam, so students were being tested on most of the material for at least a second time. Scores on the latter are likely to be higher than on the former, and that is borne out in the results. This will be an easier issue to fix in the future than the disparate test formats issue will be.	another. The latter will be helped significantly when and if functioning software is installed for the PSM&E Division's new Insight 4es test sheet scanner from Scantron. (04/18/2014)
ASTR4_SLO_3 - Evaluate astronomical news items or theories concerning solar system astronomy based upon the scientific method. **SLO Status:** Active	**Exam - Course Test/Quiz -** Objective-oriented multiple-choice questions. **Target for Success:** 65%	**Program Review Reporting Year:** 2018-2019 **Target :** Target Not Met Assessment Data Summary, end of 2018-2019 Prepared by Marek Cichanski, Astronomy Dept. Coordinator To assess ASTR4_SLO_3, I chose two multiple-choice questions from the first (of three) midterm exams from my Winter 2019 Astronomy 4 class.	**Enhancement:** Based on the Assessment Data Summary and the Reflection for this SLO at the end of the 2018-2019 school year, I may consider going over sample questions in class, to show how the appearance of a "familiar-

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		Background Information: My multiple-choice questions typically have four choices, one of which (the best answer) gets full points. There is usually a second-best choice, which gets about 3/4 of the full points, and two "wrong answer" choices that get 1/2 of the full points. This partial-credit system accomplishes roughly the same thing as "curving" the grades, while still using a fixed grading scale, and thus avoids putting the students in direct competition with each other for grades. The two questions that I chose to assess SLO 3 both concerned an important moment from the history of astronomy, when the pioneering astronomer Galileo Galilei observed the planet Venus through the telescope, to see whether it showed a full cycle of phases like the Moon, or only crescent phases. This was an example of using observational data to determine which of two hypotheses about the nature of the solar system (geocentric or heliocentric) was more likely to be correct. This is an example of "evaluating a theory based on upon the scientific method", to quote from this SLO. In the first question, students were asked what Galileo saw, and how it didn't fit with the geocentric model. 12% of the students taking this test chose the correct answer, 27% chose the second best answer, and 32% chose the wrong answers. In the second question, students were given a perspective drawing of Venus orbiting the Sun, and showing different phases at different points in its orbit, as seen from Earth. Students were asked how the images of Venus in this diagram compare with what Galileo saw. 55% chose the best answer, 13% chose the second-best answer, and 32% chose the wrong answers. (06/30/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** When I examined the choices that students made on both questions, it appeared that the most popular choices both included the phrase "shows a full cycle of phases". On the first of the two questions described in the Assessment Data	looking" or "correct-looking" phrase can be a trap for the unwary. Further, deeper reading of the choices can be necessary to find the right one. (06/30/2019)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		Summary, it was one of the WRONG choices that had that phrase in it. On the second of the two questions described in the Assessment Data Summary, it was the CORRECT choice that had that phrase in it. This suggests to me that students may "key in" on a particular phrase that they've encountered in their readings or in the lecture, even if that phrase is found in one of the wrong answer choices. It suggests, but does not prove, that they might not be taking the time to read all of the choices carefully enough to encounter the specific details that matter the most.	
		Program Review Reporting Year: 2013-2014 **Target :** Target Met Final Exam, Astronomy 4.02, Winter 2014 (Harrington): Seven questions were related to this objective. 120 students took the exam. Of the 840 responses to those questions, 769 were correct, for a success rate of 92%. (04/18/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** As with all the other data gathered in this first round of assessments, there is still more discussion going on about the data gathering itself than about what to do on the basis of the data. In particular, we need to find a way to be more uniform in our data gathering in the future in order not to be "comparing apples and oranges" and to establish a meaningful baseline. Two issues are particularly problematic for us in the data gathering we have done in this first round for both Astronomy 4 and Astronomy 10: different testing formats and different times during the quarter when assessments were done. Testing formats: The four of us who teach Astronomy courses use three different formats of "bubble sheet" exams. Two use conventional "one best answer" multiple choice exams. One (Dr. Cichanski) uses an innovative format in which some partial credit is given for certain not-optimum responses. The other (Mr. Harrington) uses a format in which students explicitly assess whether each answer in a single question group is right or wrong. We are having lively discussions about how to compare our scores	**Enhancement:** A more uniform protocol for gathering data will be formulated by the department, in which data will be gathered at the same time in the quarter (probably final exams) and differences in testing styles will be accommodated in a way that produces results that can legitimately be compared to one another. The latter will be helped significantly when and if functioning software is installed for the PSM&E Division's new Insight 4es test sheet scanner from Scantron. (04/18/2014)

in a meaningful way while preserving our individual testing methods.
Times of assessment: The Astronomy 10 assessments were conducted on midterm exams, in which students were being tested on the material for the first time. The Astronomy 4 assessments were conducted on a comprehensive final exam, so students were being tested on most of the material for at least a second time. Scores on the latter are likely to be higher than on the former, and that is borne out in the results. This will be an easier issue to fix in the future than the disparate test formats issue will be.

Assessment: Course/Service Four Column

Dept - (PSME) Physics

PHYS 10:Concepts of Physics

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
PHYS10_SLO_1 - Critically examine new, previously un-encountered problems, analyzing and evaluating their constituent parts, to construct and explain a logical solution utilizing, and based upon, the fundamental laws of physics in general. **SLO Status:** Active	**Exam - Course Test/Quiz -** Although numerous written, verbal quizzes are given, the most fun is had with the multiple choice exams. Non-science majors must grapple with not just finding the "right" answer but, and here is the good part, the "best" or "most correct" answer. As always the true test of knowledge is how you handle yourself when you don't already know the answer (i.e., it is not about memorizing answers). **Target for Success:** 70% of students to pass	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met On one sample question of this instructor's own evil invention, out of fifty students about ten students got it right (not bad actually), twenty or so chose the next best answer (still correct but not as good) and the rest well, what can I say (see below)? (12/04/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Overall I'm not ashamed to confess that physics 10 provides a successful environment for the non-science major to learn and appreciate the subject. The class is not about mastering the subject, but appreciating it. The course could use a lab to compliment the lecture but the logistics would be complicated.	

PHYS 2A:General Introductory Physics

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
PHYS2A_SLO_1 - Critically examine new, previously un-encountered problems, analyzing and evaluating their constituent parts, to construct and explain a logical solution utilizing, and based upon, the fundamental laws of mechanics **SLO Status:** Active **Planned Assessment Quarters:** 2012-13 3-Winter	**Exam - Course Test/Quiz -** As assessment tools we used selective new un-encountered problems on the lecture final. Assessment was then based on the scores obtained on these selective problems on an individual and overall class basis. The following problem on the lecture final was used as an assessment: 7. A wheel of radius 0.30 m is mounted on a frictionless horizontal axle as shown below. A massless cord is wrapped around the wheel and attached to a 4.0 kg block that slides down a frictionless incline plane of angle ? = 30. The block accelerates down the surface at 3.0 m/s2. Calculate the moment of inertia of the wheel about the axle of rotation. **Target for Success:** 70% of students to solve it correctly.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met About 72% of the class was able to solve the problem correctly, 15% partially got it correct, and 13% did not know how to solve it. (11/17/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** About 13% of the class needed to improve their analytical and problem solving skills. 72% success was acceptable for the class. Areas for improvement would be to further help students develop their analytical and problem solving skills using the principles/laws/theories of classical mechanics. Based on previous performances for such a class, the results are reasonably acceptable.	
PHYS2A_SLO_2 - Gain confidence in taking precise and accurate scientific measurements, with their uncertainties, and then with calculations from them, analyze their meaning as relative, in an experimental context, to the verification and support of physics theories. **SLO Status:** Active	**Exam - Course Test/Quiz -** Proper knowledge of the Scientific Lab Report as accessed in the lab final including; scientific measurements with uncertainties, error analysis, calculations, and hands-on experience with the experimental method. The following problem was used as an assessment on error analysis in the lab:Given the metal block provided, using the proper measuring instrument, measure the dimensions and the mass with uncertainty and then calculate the	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met About 75% of the the class solved the problem correctly. This result was 5% less than the last assessment. Nonetheless, it was still above the expected target. (11/17/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** About 75% of the class was able to solve the problem correctly, 15% partially got it correct, and 10% did not know how to solve it. 75% success was acceptable for the class and thus there weren't any apparent student needs and issues revealed. 75% success on error analysis was acceptable for the class, but not outstanding especially since it's 5% less than the last assessment. Area for improvement	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	density and uncertainty. **Target for Success:** 70% of students to solve correctly.	would be to further help students develop a conceptual and practical understanding of the physics principles in the lab. Based on previous performances for such a class, the results are reasonably acceptable.	

PHYS 2B:General Introductory Physics

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
PHYS2B_SLO_1 - Critically examine new, previously un-encountered problems, analyzing and evaluating their constituent parts, to construct and explain a logical solution utilizing, and based upon, the fundamental laws of electricity and magnetism. **SLO Status:** Active	**Exam - Course Test/Quiz -** Exams are the most telling testimony of the depth of a student's knowledge in this field. These students are confronted with basic, one-step or two, problems and, at this level, most students still find problem solving quite challenging. Usually the problems used to evaluate comprehension are similar to those with which the students is familiar, but altered slightly by the instructor. By doing so, the instructor can determine if a solution has merely been memorized, or if true understanding has been achieved. Perfection is not the goal. By testing in this manner, a student can glimpse what it means to understand. That glimpse is valuable unto itself. **Target for Success:** 70% of class to pass	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met For the typical 2B exam problem that has been slightly altered from a homework problem, out of twenty nine students, seven demonstrated mastery, nine applied general problem solving skills indicating a grasp on concepts, twelve were inadequately prepared and incapable of generalizing problems solving skills. One stopped attending after a poor first exam. (12/04/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The subject matter is challenging for this level of student (i.e., not the conceptual physics student and not the engineering major). Abstract thinking is difficult; after all, no one has ever seen an electric field. The goal of any course should be to inspire the student to think about the world in a new way and reflect upon his or her place in it. Physics 2B succeeds in teaching most, if not all, students that electric and magnetic phenomena can be understood with careful and thoughtful problem solving techniques. The assessment procedures are valid and accurately reflect learning.	
PHYS2B_SLO_2 - Gain confidence in taking precise and accurate scientific measurements, with their uncertainties, and then with calculations from them, analyze their meaning as relative, in an experimental context, to the verification and support of physics theories. **SLO Status:** Active	**Exam - Course Test/Quiz -** In the lab, many useful skills are learned. The students learn how to use electrical measurement tools including the oscilloscope and build rudimentary circuits. The lab final requires each student demonstrate every skill acquired during the quarter. In addition to testing the student's ability to measure electrical properties appropriately, the lab final also tests a student's ability to analyze data and perform	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Most students demonstrate adequate ability to take reasonably accurate measurements. For the most recent quarter, 95 percent of the students were able to pass this exam. Because there is an element of concreteness inherent to the measurement and data analysis in the lab setting, many students at this level find the lab more comprehensible and therefore more enjoyable. (12/04/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Most students succeed in the lab portion of this class if they consistently	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	uncertainty analysis. **Target for Success:** 70% of students to pass	attend and apply a bit of effort. Paying attention throughout the quarter and keeping a good lab notebook are the keys to success in lab. Since many students enjoy and gain confidence in their ability during the lab portion of this class, more lab time would be beneficial for the students. Unfortunately, more lab time than the course currently offers would not articulate to transfer institutions.	

PHYS 2C:General Introductory Physics

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
PHYS2C_SLO_1 - Critically examine new, previously un-encountered problems, analyzing and evaluating their constituent parts, to construct and explain a logical solution utilizing, and based upon, the fundamental laws of optics, thermodynamics, fluids, and modern physics. **SLO Status:** Active	**Exam - Course Test/Quiz -** As assessment method we used selective new un-encountered problems on the lecture final. Assessment was then based on the scores obtained on these selective problems on an individual and overall class basis.The following problem on the lecture final was used as an assessment: Calculate the energy required to convert a 1.0 g block of ice at -30.0oC to steam at 120.0oC. The specific heat of ice is 2090 J/(kg Co), the heat of fusion of water is 3.34 x 105 (J/kg), the heat of vaporization of water is 2.26 x 106 (J/kg), and the specific heat of steam is 2010 J/(kg Co). **Target for Success:** 70% of students to solve correctly	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met About 80% of the class was able to solve the problem correctly, 15% partially got it correct, and 5% did not know how to solve it. (11/24/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** About 20% of the class needed to improve their analytical and problem solving skills. 80% success was acceptable for the class. Areas for improvement would be to further help students develop their analytical and problem solving skills using the principles/laws/theories of thermodynamics. Based on previous performances for such a class, the results are reasonably acceptable.	
PHYS2C_SLO_2 - Gain confidence in taking precise and accurate scientific measurements, with their uncertainties, and then with calculations from them, analyze their meaning as relative, in an experimental context, to the verification and support of physics theories. **SLO Status:** Active	**Exam - Course Test/Quiz -** Proper knowledge of the Scientific Lab Report was used as an assessment method during the lab final. This included understanding scientific measurements with uncertainties, error analysis, calculations, and hands-on experience with the experimental method. The following problem was used as an assessment on error analysis in the lab: 1. Measure the dimensions of the metal object with the vernier calipers: H= ____________________ D= ____________________	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met About 76% of the class was able to solve the problem correctly, 20% partially got it correct, and 4% did not know how to solve it. (11/24/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 76% success was acceptable for the class and thus there weren't any apparent student needs and issues revealed. 76% success on error analysis was acceptable for the class, but not outstanding. Area for improvement would be to further help students develop a conceptual and practical understanding of the physics principles in the lab. Based on previous performances for such a class, the results are reasonably acceptable.	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	2. Calculate the volume of the object. 3. Measure the mass with the triple-beam balance: M = __________________ 4. Calculate the density of the object along with the uncertainty. 5. Using Archimede's Principle prove the equation: 6. Submerge the object with a string into the water container provided and measure the tension using the spring scale. Calculate density using the equation in step (5). 7. Compare by taking the result of step (4) to be the expected value. That is calculate the % error. 8. Identify one source of random AND systematic error in your results. 9. Explain why the errors are random/systematic and what effect did they have on the density calculations. **Target for Success:** 70% of students to solve correctly		

PHYS 4A:Physics for Scientists and Engineers: Mechanics

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
PHYS4A_SLO_1 - Critically examine new, previously un-encountered problems, analyzing and evaluating their constituent parts, to construct and explain a logical solution utilizing, and based upon, the fundamental laws of mechanics. **SLO Status:** Active	**Exam - Course Test/Quiz -** As an assessment method we used selective new un-encountered problems on the lecture final. Assessment was then based on the scores obtained on these selective problems on an individual and overall class basis.The following problem on the lecture final was used as an assessment: The acceleration of a marble in a certain fluid is proportional to its velocity squared, and is given (in units of m/s2) by a = -3v2 for v > 0. If the marble enters this fluid with a speed of 1 m/s, calculate the speed of the marble at t = 1/3 s after it enters the fluid. **Target for Success:** 70% of students to solve correctly	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met About 70% of the class was able to solve the problem correctly, 5% partially got it correct, and 25% did not know how to solve it. (11/24/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** About 25% of the class needed to improve their analytical and problem solving skills. 70% success was acceptable for the class. Areas for improvement would be to further help students develop their analytical and problem solving skills using the principles/laws/theories of classical mechanics. Based on previous performances for such a class, the results are reasonably acceptable.	
PHYS4A_SLO_2 - Gain confidence in taking precise and accurate scientific measurements, with their uncertainties, and then with calculations from them, analyze their meaning as relative, in an experimental context, to the verification and support of physics theories. **SLO Status:** Active	**Exam - Course Test/Quiz -** Proper knowledge of the Scientific Lab Report was used as an assessment method during the lab final. This included understanding scientific measurements with uncertainties, error analysis, calculations, and hands-on experience with the experimental method. The following problem was used as an assessment on error analysis in the lab: Consider the following set of data for the dimensions of a rectangular aluminum block for the density lab: L1 = 3.868 cm ± 0.001 cm	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met About 85% of the class was able to solve the problem correctly, 5% partially got it correct, and 10% did not know how to solve it. (11/24/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 85% success was acceptable for the class and thus there weren't any apparent student needs and issues revealed. 85% success on error analysis was acceptable for the class. Area for improvement would be to further help students develop a conceptual and practical understanding of the physics principles in the lab. Based on previous performances for such a class, the results are reasonably acceptable.	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	L2 = 2.540 cm ± 0.001 cm L3 = 1.826 cm ± 0.001 cm M = 48.59 g ± 0.01 g 1. What instrument was used to measure the length dimensions of the block? 2. What instrument was used to measure the mass of the block? 3. Calculate the volume of the block. 4. Calculate the uncertainty in the volume of the block. 5. Calculate the density of the block. 6. Calculate the uncertainty in the density of the block. 7. What was the source of error for the uncertainty in the density? 8. Was the propagating error in the density (uncertainty) significant? Explain. **Target for Success:** 70% of students to solve correctly		

PHYS 4B:Physics for Scientists and Engineers (Electricity and Magnetism)

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
PHYS4B_SLO_1 - Critically examine new, previously un-encountered problems, analyzing and evaluating their constituent parts, to construct and explain a logical solution utilizing, and based upon, the fundamental laws of electricity and magnetism. **SLO Status:** Active	**Exam - Course Test/Quiz -** The students were presented with a problem they had never seen (since the instructor made it up exclusively for their exam) within an examination format. They were required to present a thorough and complete explanation that included mathematical and verbal logic to arrive at the final answer. **Target for Success:** 70% of students to solve correctly	**Program Review Reporting Year:** 2012-2013 **Target :** Target Not Met Of the forty-two students presented with the problems, two got the problem completely correct, six explained the problem well, twenty gave explanations that would be considered mediocre but marginally acceptable and the rest did not have any idea about what they were talking about. (12/04/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Nobody ever said learning physics was easy and this proves it; there are those who consider this class among the most difficult at the college. The bottom line is that studying well (i.e., time spent with quality concentration) pays off and not studying doesn't; getting students to appreciate this is the real challenge. A low student-to-teacher ratio is critical; office hour work with just a handful of students is productive. The good fight never ends.	
PHYS4B_SLO_2 - Gain confidence in taking precise and accurate scientific measurements, with their uncertainties, and then with calculations from them, analyze their meaning as relative, in an experimental context, to the verification and support of physics theories. **SLO Status:** Active	**Exam - Course Test/Quiz -** The students were given ample opportunity to learn, use, and operate the oscilloscope. They were told flat out that they would have to use one to take measurements on their lab final exam and indeed, that's what happened. **Target for Success:** 70% of students to use properly	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met Really, they did pretty well here. Using equipment is easier to learn than abstract mathematical thinking and concepts. Of the twenty people who took one lab final (there was another one given to a second class), ten measured with acceptable accuracy, five moderately well and five others just didn't get it. (12/04/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** People can learn manual measurement skills if they have enough time and adequate feedback. It is easy to test a student to see if they can measure a number accurately. Repetition is the key here. All thing considered, I think we are doing a good job here. The students with trouble need more practice time.	

PHYS 4C:Physics for Scientists and Engineers: Fluids, Waves, Optics and Thermodynamics

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
PHYS4C_SLO_1 - Critically examine new, previously un-encountered problems, analyzing and evaluating their constituent parts, to construct and explain a logical solution utilizing, and based upon, the fundamental laws of waves, fluids, optics, and thermodynamics. **SLO Status:** Active	**Exam - Course Test/Quiz -** Final examination to test conceptual understanding as well as problem solving ability **Target for Success:** 70% of students to pass	**Program Review Reporting Year:** 2012-2013 **Target :** Target Not Met Average score on final exam Winter 2013 Physics 4C was 64 % indicating that students were able to learn approximately 2/3 of the conceptual and problem solving skills. (12/04/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** This is a score that is a little low even for students taking advanced physics classes. Expected average would be more like 70 %. However this is an improvement over scores from 2012 where the final exam average was 57 %. My analysis is that students benefitted from a more rigorous treatment of formal thermodynamic proofs – a format which is unfamiliar to many students. I also believe that attention to the difference between force and energy in wave analysis led to better results on wave questions.	
PHYS4C_SLO_2 - Gain confidence in taking precise and accurate scientific measurements, with their uncertainties, and then with calculations from them, analyze their meaning as relative, in an experimental context, to the verification and support of physics theories. **SLO Status:** Active	**Exam - Course Test/Quiz -** Students are given a lab final in which they must explain physical aspects of the equipment that was used to do experiments, the theory behind the experiments and do "error analysis" (analysis of data given uncertainties) **Target for Success:** 70% of students to pass	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met The average student score on the lab final was 76.5 percent for physics 4C Winter 2013 (12/04/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** This is an acceptable percentage for advanced physics lab indicating that students understood, reasonably well, the scientific method, the physics of the experiments as well as uncertainty analysis. For Winter of 2012 the score was 63.5 %. The improvement may be due to having students analyze the physics of the experiments prior to entering the lab so that they can focus on the experiment a little better (which aids data collection as well as anaylsis). I think that I will continue that proactice going forward.	

PHYS 4D:Physics for Scientists and Engineers (Modern Physics)

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
PHYS4D_SLO_1 - Critically examine new, previously un-encountered problems, analyzing and evaluating their constituent parts, to construct and explain a logical solution utilizing, and based upon, the fundamental laws of modern physics. **SLO Status:** Active	**Exam - Course Test/Quiz -** As an assessment method we used selective new un-encountered problems on the lecture final. Assessment was then based on the scores obtained on these selective problems on an individual and overall class basis.The following problem on the lecture final was used as an assessment: An electron moving in a 1-D box of length L is trapped in the n = 5 state. a. Calculate the probability of finding the electron in the (0.2L < x < 0.4L) b. Calculate the probability of finding the electron within the interval ?x = 0.001L at x = 3L/8. (Hint: since ?x is very small you do not have to integrate!) c. Calculate the energy of the electron in this state. d. Write the complete wavefunction. e. If the particle is in the n = 1000 state, what is the probability of finding the electron in the interval (L/3<x<2L/3)? **Target for Success:** 70% of students to solve it correctly.	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met About 90% of the class was able to solve the problem correctly, 5% partially got it correct, and 5% did not know how to solve it. (11/24/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** About 5% of the class needed to improve their analytical and problem solving skills. 90% success was acceptable for the class. Areas for improvement would be to further help students develop their analytical and problem solving skills using the principles/laws/theories of quantum mechanics. Based on previous performances for such a class, the results are reasonably acceptable.	
PHYS4D_SLO_2 - Gain confidence in taking precise and accurate scientific measurements, with their uncertainties, and then with calculations from them, analyze their	**Exam - Course Test/Quiz -** Proper knowledge of the Scientific Lab Report was used as an assessment method during the lab final. This included understanding scientific	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met About 85% of the class was able to solve the problem correctly, 10% partially got it correct, and 5% did not know how to solve it. (11/24/2013)	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
meaning as relative, in an experimental context, to the verification and support of physics theories. **SLO Status:** Active	measurements with uncertainties, error analysis, calculations, and hands-on experience with the experimental method. The following problem was used as an assessment on error analysis in the lab: a) The Fractional Energy Resolution is defined by the following expression: Fractional energy resolution= .... a)Explain why Fractional Energy Resolution is important in any energy spectroscopy experiment such as the one you performed. b) Suppose you measured the fractional energy resolution of three different gamma-rays and the results were the following: gamma-ray 1: 0.055 gamma-ray 2: 0.982 gamma-ray 3: 0.00046 Draw a sketch of how each of the peaks should appear in the gamma-ray spectrum. c) Is it preferable to have low resolution peaks or high resolution peaks? Explain your answer. d) Explain one systematic and one random source of error involved that may have led you to identify the wrong elements in the unknown sample. Systematic Error- Random Error -	**Reflection (CLICK ON ? FOR INSTRUCTIONS):** 85% success was acceptable for the class and thus there weren't any apparent student needs and issues revealed. 85% success on error analysis was acceptable for the class. Area for improvement would be to further help students develop a conceptual and practical understanding of the physics principles in the lab. Based on previous performances for such a class, the results are reasonably acceptable.	

Target for Success: 70% of students to solve correctly

PHYS 50:Preparatory Physics

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
PHYS50_SLO_1 - Critically examine new, previously un-encountered problems, analyzing and evaluating their constituent parts, to construct and explain a logical solution utilizing, and based upon, the fundamental laws of mechanics **SLO Status:** Active	**Exam - Course Test/Quiz -** As an assessment method we used selective new un-encountered problems on the lecture final. Assessment was then based on the scores obtained on these selective problems on an individual and overall class basis.The following problem on the lecture final was used as an assessment: A cat is standing on a stationary merry-go-round at a radius of 6.0 m from the center of the ride. Then the operator turns on the ride and brings it up to a rotating rate of one revolution every 4.0 s. Calculate the minimum coefficient of friction so that the cat doesn't "slide off". **Target for Success:** 70% of students to solve it correctly	**Program Review Reporting Year:** 2012-2013 **Target :** Target Met About 75% of the class was able to solve the problem correctly, 10% partially got it correct, and 15% did not know how to solve it. (11/24/2013) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** About 15% of the class needed to improve their analytical and problem solving skills. 75% success was acceptable for the class. Areas for improvement would be to further help students develop their analytical and problem solving skills using the principles/laws/theories of classical mechanics. Based on previous performances for such a class, the results are reasonably acceptable.	

PHYS 77 (X-Y):Special Projects in Physics

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
PHYS77_SLO_1 - Investigate an area of special interest and demonstrate an appropriate level of understanding and expertise. **SLO Status:** Active **Outcome Creation Date:** 02/11/2018			

Assessment: Course/Service Four Column

Dept - (PSME) Geology

GEOL 10:Introductory Geology

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
GEOL10_SLO_2 - Use data and observations to track and predict changes in the Earth system resulting from dynamic Earth Processes. **SLO Status:** Active **Planned Assessment Quarters:** 2011-12 2-Fall, 2011-12 3-Winter, 2011-12 4 -Spring **Outcome Creation Date:** 07/15/2012	**Exam - Course Test/Quiz -** Questions from midterm exams and questions from final exam, selected for their relevance to SLO 2. **Target for Success:** 50% of students will answer this question correctly.	**Program Review Reporting Year:** 2018-2019 **Target :** Target Not Met Assessment Data Summary, end of 2018-2019 Prepared by Marek Cichanski To assess GEOL10_SLO_2, I chose a multiple-choice question from the third (of three) midterm exams from my Geology 10 class. Background Information: My multiple-choice questions typically have four choices, one of which (the best answer) gets full points. There is usually a second-best choice, which gets about 3/4 of the full points, and two "wrong answer" choices that get 1/2 of the full points. This partial-credit system accomplishes roughly the same thing as "curving" the grades, while still using a fixed grading scale, and thus avoids putting the students in direct competition with each other for grades. This SLO concerns changes that occur to the Earth system as a result of process that operate in and on the Earth. One example of this is the motions of the continents, which are a consequence of the larger set of plate-tectonic motions that occur in the Earth's lithosphere. These motions are recorded at times and places where the Earth's magnetic field (which, it should be pointed out, does not cause the motions) gets "frozen into" certain types of rock. This paleomagnetic record allowed geoscientists in the mid-20th century to determine that it was not the Earth's magnetic	**Enhancement:** Since there seems to have been some confusion regarding apparent polar-wander paths and field reversals, it might be worth emphasizing the difference by means of some sort of in-class exercise, like think-pair-share questions or anyonymous, `clicker'-style voting. (06/30/2019)

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		poles that had wandered, but the continents. The question I chose for assessing this SLO asked the students to imagine collecting paleomagnetic records from several continents, at many times throughout Earth history. If the resulting "apparent polar-wander paths" from these different continents only agree for the present time, what does this mean? The correct answer is that the continents have moved. The second-best answer is that there has recently been a magnetic field reversal. 47% of students chose the correct answer, 20% chose the second-best answer, and 33% chose one of the wrong answers. (06/30/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Taken together, the percentages of students choosing the best and second-best answers amounts to two-thirds of the class. It is interesting to consider possible reasons why a large fraction of the class chose the second-best answer, which referred to the reversals of the magnetic field. One hypothesis that could explain this would be a type of 'recency bias'. When the material about continental drift and plate tectonics was presented, the part about apparent polar-wander paths was presented first. Then there was a section about the reversals of the Earth's magnetic field. It is possible that, when presented with a complicated-looking question about paleomagnetism, students might have grabbed the most "recently-installed" information, which was about reversals.	
		Program Review Reporting Year: 2011-2012 **Target :** Target Met This SLO was assessed by tabulating the multiple-choice responses that the students selected on their tests. (The Parscore system made it possible to count how many students selected `a', `b', etc? for any given question.) For each test question used in the SLO assessment, there is a correct response, one or more `bad' responses, and in most cases, an `almost correct' response. Each question had four choices, total - one correct, two or three bad choices, and in most cases, one `almost correct' choice.	**Enhancement:** Enhancement / Action: This is a generalized Action plan for Enhancement of student success in the Student Learning Outcomes for Geology 10. It is based on SLOAC results for one year of SLO 1 (2010-2011) and one year of SLO 2 (2011-2012). Averaged over two school years

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		Each test question that was chosen for SLO assessment was evaluated in the following way: The percentage of students choosing the `correct', `almost', and `bad' choices were reported as a percentage of total responses. The total number of tests used in the assessment was also recorded. For example, if 75 tests were used, this was reported as `N=75'. The results of the tabulation(s) can be seen as a PDF file in the `Related Documents'.  For the assessment of SLO 2 in Spring 2012, questions were chosen from the midterm exams (2 from the second exam, `E2', and one from the third exam, `E3'), and from the final exam. The class assessed in Spring 2012 was a night class. On E2, the first question assessed involved looking at some drawings of tilted rock layers, and using the sedimentary structures in those layers to decide which drawing showed a set of overturned rock layers. The percentages of correct answers chosen (47 percent) and incorrect answers chosen (53 percent) were similar. E2, second question: Students were asked to imagine that they were measuring and describing the thicknesses and compositions of a stack of sedimentary beds. Given that they are able to see the exposed edges of these layers, what happened to the layers after deposition? This tests students on their understanding of Steno's third principle, a key tool in using data to track and predict changes in the Earth system. 78 percent of students chose the correct response (erosion), 13 percent chose the `almost' response (tilting), and 9 percent chose one or the other of the bad responses (metamorphism, folding). On E3, students were asked to imagine that they have seen gneiss (a metamorphic rock) in the Alps. Where did the deformation that they observe in the rock form? 60 percent chose the correct answer (in the mid to lower crust), 9 percent chose the `almost' answer (in the upper crust), and	and both SLOs, a broad pattern exists for student performance on a typical 4-item multiple-choice question from an in-class exam: About 60 percent of the students choose the correct response, with the remainder of the chosen responses distributed pretty evenly between the three incorrect choices. This performance level thus represents a `baseline' from which improvements can be sought.  Examples of low and high success rates on SLO-assessment embedded questions can be drawn from a number of different parts of the `parameter space' represented by the overall pool of assessed questions. In some cases, students will succeed at an SLO by remembering key facts or data that they need in order to assess a hypothesis or track or predict some change in the Earth system. In other cases, the key facts are remembered less well, resulting in a lower success rate on the SLO. To the extent that this is correlated with subject matter, the most difficult `memory challenges' occur in the most complex subjects covered in Geology 10, particularly the subject of plate tectonics. This suggests that where the material involves a large number of details that have to be `kept straight', additional pedagogical emphasis is

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		31 percent chose one or the other of the bad answers (in the inner or outer core). Final, first question assessed: As in Fall 2011 and Winter 2012, students were asked why Precambrian rocks do not show much of a fossil record. 83 percent of students chose the correct answer (organisms had not yet evolved hard skeletal parts), 4 percent chose the `almost' answer (there were no more organisms with hard skeletal parts, which gets Earth history backward), and 13 percent chose one or the other of the bad answers (non-factual accounts of climate and sedimentation). Final exam, second question: Students were asked to describe some of the original evidence for an ice age. 63 percent of students selected the correct choice (moraines far from present-day glaciers), no one selected the `almost' choice (volcanic landforms that erupted through ice), and 37 percent selected one or the other of the bad choices (non-factual scenarios). (07/18/2012) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** E2, first question: In this case, students did not generally do a good job of recognizing `upside-down' sedimentary structures. They had been presented with examples of this sort of thing in class, but did not seem to have retained the point of the examples as well as might be desired. As with many of the other `reflections and analyses' in the first cycle of SLO 1 and 2 assessments, it might be concluded that a greater degree of `hands-on' involvement with the material, through problem-solving exercises, might improve student performance on this SLO. E2, second question: Student success on this question was good, with correct responses outnumbering incorrect ones by nearly 4 to 1. The point in question here, Steno's third principle (sometimes called `concealed stratification' or `lateral continuity'), was given particular emphasis by the instructor during lecture. This raises - but does not prove - the possibility that it is possible to increase student success in a particular measure of an SLO simply through careful	needed. Students in Geology 10 face other challenges as well, such as interpreting visual cues from drawings, or visualizing scenarios described to them in words. This suggests that additional pedagogical emphasis may be needed for all forms of visualization and visual pattern recognition. Specific pedagogical actions can be undertaken to try and increase success rates on SLOs. The most attractive set of new teaching methods falls under the heading of `peer instruction'. Pioneered by instructors like Eric Mazur, a physics professor at Harvard, they involve students attempting to answer conceptual questions about the material, and then attempting to explain their answers to each other. Peer-instruction methods can take many forms, such as `think-pair-share' exercises, and the use of Personal Response System (`clickers'). Research by instructors like Mazur at Harvard, and a number of instructors in Geology and Astronomy at several universities, have demonstrated (through research and data) that peer-instruction methods can significantly enhance student understanding of material.

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		emphasis of that topic in class. E3: A large fraction of the students chose answers that were wide of the mark, and which reflected a misunderstanding of where (in the Earth) different types of deformation occur, and the fact that the iron from the core does not get exposed at the surface. The material on types of deformation probably needs to be presented in a different way, along with a re-emphasis of the point (made at the beginning of the quarter) that the core is too dense for any of it to be exposed at the Earth's surface. Final, first question: The success rate were quite high for this assessment of SLO 2, at nearly 85 percent. This part of the story of the evolutionary history of life on Earth seems to be a reasonably straightforward thing for students to understand and to recall. Final, second question: Success was high, at over 60 percent, but a significant fraction of the class (slightly over a third) chose one of the factually incorrect scenarios given as answer choices. This raises the question of how completely the subject was covered in the reading and lectures, relative to other parts of the topic of glaciation. Previous quarters (e.g. Winter 2012) did better on this assessment of SLO 2, so clearly it is possible for students to succeed at higher rates in this area. **Related Documents:** Geol_10_SLO_2_Sp2012	The Geology department has already done research on these methods, and has made preliminary efforts to experiment with them. For example, in-class experiments have been done in Geology 10 to try and use the PSME Division's set of clickers in class. Thus far, these experiments have mostly involved trying to work out the *logistical* details of implementing systems like those used at other schools. Given the fact that De Anza College does not have graduate teaching assistants or other resources, such as a 4-year school might have, the implementation of peer-instruction methods can be difficult. Additionally, whereas a 4-year school might easily be able to ask its students to buy in-class tools like clickers, this would be a difficult thing to ask of our students. Thus, it has been necessary to experiment with the rather basic set of clickers available in the PSME Division. New ways of implementing this technology, in which the students do not buy or own their own clickers, are in the process of development. While technology like `clickers' is only one example of peer-based instruction, it is generally hoped that experiments with peer instruction and related pedagogy can lead to greater student

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			success in the learning outcomes for Geology 10. Experiments with these methods over the next few years will hopefully yield data that can be compared with the 2010-2011 and 2011-2012 cycles for SLO 1 and SLO 2. (07/18/2012)
		Program Review Reporting Year: 2011-2012 **Target :** Target Met This SLO was assessed by tabulating the multiple-choice responses that the students selected on their tests. (The Parscore system made it possible to count how many students selected \`a', \`b', etc? for any given question.) For each test question used in the SLO assessment, there is a correct response, one or more \`bad' responses, and in most cases, an \`almost correct' response. Each question had four choices, total - one correct, two or three bad choices, and in most cases, one \`almost correct' choice.  Each test question that was chosen for SLO assessment was evaluated in the following way: The percentage of students choosing the \`correct', \`almost', and \`bad' choices were reported as a percentage of total responses. The total number of tests used in the assessment was also recorded. For example, if 75 tests were used, this was reported as \`N=75'.  The results of the tabulation(s) can be seen as a PDF file in the \`Related Documents'. For the assessment of SLO 2 in Winter 2011, one question was selected from each midterm exam (\`E1', \`E2', and \`E3'), and two questions were selected from the final exam. On E1, the students were asked to imagine that they were exploring the Goat Rocks, a real place in Washington state. This group of small mountains are the remnants of an extinct, eroded volcano, made of alternating layers of ash and lava. What type of volcano was the Goat Rocks at an	**Enhancement:** Enhancement / Action: This is a generalized Action plan for Enhancement of student success in the Student Learning Outcomes for Geology 10. It is based on SLOAC results for one year of SLO 1 (2010-2011) and one year of SLO 2 (2011-2012). Averaged over two school years and both SLOs, a broad pattern exists for student performance on a typical 4-item multiple-choice question from an in-class exam: About 60 percent of the students choose the correct response, with the remainder of the chosen responses distributed pretty evenly between the three incorrect choices. This performance level thus represents a \`baseline' from which improvements can be sought.  Examples of low and high success rates on SLO-assessment embedded questions can be drawn from a number of different parts of the \`parameter space' represented by the overall pool of

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		earlier time in Earth history? 62 percent of students chose the correct response (a composite volcano, or `stratovolcano'), 10 percent chose the `almost' response (a shield volcano), and 28 percent chose one or the other of the bad responses (cinder cone, rhyolite dome, both of which are relatively small). On E2, students were asked about the significance of the `leftovers' of weathering. By choosing the correct response, they could demonstrate their understanding of how rocks and Earth materials change through time. 62 percent of students chose the correct response (the `leftovers' are the ingredients of sedimentary rocks), 32 percent chose one or the other of the bad responses (various factually incorrect statements), and 6 percent chose the `almost' response. E3: The re-arrangement of the positions of the continents through time is one of the most important changes in the Earth system that can be tracked with data. In the selected question from E3, students were asked to identify a piece of evidence that had been used by Alfred Wegener when he first proposed the existence of the supercontinent Pangea. 66 percent of students chose the correct answer (Paleozoic orogens divided across the Atlantic), 18 percent chose the `almost' answer (pre-Paleozoic orogens divided across the Pacific), and 16 percent chose one or another of the bad answers (various non-factual accounts). Final exam, first question: As was done for SLO 2 in Fall 2011, students were asked why Precambrian rocks don't show much of a fossil record. 69 percent of students chose the correct answer (organisms hadn't yet evolved hard skeletal parts), 9 percent chose the `almost' answer (there were no more organisms with hard skeletal parts, a choice which gets Earth history backward), and 22 percent chose one or the other of the bad answers (non-factual accounts of erosion and sedimentation). Final exam, second question: Students were asked to describe some of the original evidence for an ice age. 78	assessed questions. In some cases, students will succeed at an SLO by remembering key facts or data that they need in order to assess a hypothesis or track or predict some change in the Earth system. In other cases, the key facts are remembered less well, resulting in a lower success rate on the SLO. To the extent that this is correlated with subject matter, the most difficult `memory challenges' occur in the most complex subjects covered in Geology 10, particularly the subject of plate tectonics. This suggests that where the material involves a large number of details that have to be `kept straight', additional pedagogical emphasis is needed. Students in Geology 10 face other challenges as well, such as interpreting visual cues from drawings, or visualizing scenarios described to them in words. This suggests that additional pedagogical emphasis may be needed for all forms of visualization and visual pattern recognition. Specific pedagogical actions can be undertaken to try and increase success rates on SLOs. The most attractive set of new teaching methods falls under the heading of `peer instruction'. Pioneered by instructors like Eric Mazur, a

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		percent of students selected the correct choice (moraines far from present-day glaciers), 9 percent selected the `almost' choice (volcanic landforms that erupted through ice), and 13 percent selected one or the other of the bad choices (non-factual scenarios). (07/18/2012) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** E1: Students succeeded at SLO 2 at a high level, over 60 percent, although this number could conceivably be improved. It is possible that those students who got the question wrong might have had difficulty *visualizing* the landscape being very different in the past. They might also have failed to pick up on the key clue - that the alternating layers of ash and lava are what made the old edifice a composite volcano. E2: Student success was reasonably high - about 2-to-1 in favor of the correct response over the aggregate of the bad ones - but it might be higher, if students had more experience working with the concept of the rock cycle. E3: Student success was good for this particular assessment of SLO 2, with the percentage of correct choices greatly outnumbering the percentages for any of the other choices. It seemed in this case that students remembered well the `story' of how Wegener first proposed continental drift. Final, first question: Students succeeded at a high level on SLO 2 in this case, with correct responses very greatly outnumbering incorrect ones. However, it might be possible to increase the success rate in this aspect of SLO 2. This would involve finding a way to make students remember this facts about the history of life on Earth better, or making it easier to understand those facts. One suggestion might be to incorporate more exercises involving paleontology and fossils into the class, either as think-pair-share exercises in the lecture hall, or in the laboratory portion of the class. Final, second question: The success rate was fairly high for this assessment of SLO 2. In order to try and improve the	physics professor at Harvard, they involve students attempting to answer conceptual questions about the material, and then attempting to explain their answers to each other. Peer-instruction methods can take many forms, such as `think-pair-share' exercises, and the use of Personal Response System (`clickers'). Research by instructors like Mazur at Harvard, and a number of instructors in Geology and Astronomy at several universities, have demonstrated (through research and data) that peer-instruction methods can significantly enhance student understanding of material. The Geology department has already done research on these methods, and has made preliminary efforts to experiment with them. For example, in-class experiments have been done in Geology 10 to try and use the PSME Division's set of clickers in class. Thus far, these experiments have mostly involved trying to work out the *logistical* details of implementing systems like those used at other schools. Given the fact that De Anza College does not have graduate teaching assistants or other resources, such as a 4-year school might have, the implementation of peer-instruction methods can be difficult. Additionally, whereas a 4-

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		success rate, it would probably be necessary for students to have read, heard, or researched an even more detailed account of the Earth's glacial history and how this history was elucidated. **Related Documents:** Geol_10_SLO_2_W2012	year school might easily be able to ask its students to buy in-class tools like clickers, this would be a difficult thing to ask of our students. Thus, it has been necessary to experiment with the rather basic set of clickers available in the PSME Division. New ways of implementing this technology, in which the students do not buy or own their own clickers, are in the process of development. While technology like `clickers' is only one example of peer-based instruction, it is generally hoped that experiments with peer instruction and related pedagogy can lead to greater student success in the learning outcomes for Geology 10. Experiments with these methods over the next few years will hopefully yield data that can be compared with the 2010-2011 and 2011-2012 cycles for SLO 1 and SLO 2. (07/18/2012)
		Program Review Reporting Year: 2011-2012 **Target :** Target Met This SLO was assessed by tabulating the multiple-choice responses that the students selected on their tests. (The Parscore system made it possible to count how many students selected `a', `b', etc? for any given question.) For each test question used in the SLO assessment, there is a correct response, one or more `bad' responses, and in most cases, an `almost correct' response. Each question had four choices, total - one correct, two or three bad choices, and in most cases, one `almost correct' choice.	**Enhancement:** Enhancement / Action: This is a generalized Action plan for Enhancement of student success in the Student Learning Outcomes for Geology 10. It is based on SLOAC results for one year of SLO 1 (2010-2011) and one year of SLO 2 (2011-2012). Averaged over two school years

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		Each test question that was chosen for SLO assessment was evaluated in the following way: The percentage of students choosing the `correct', `almost', and `bad' choices were reported as a percentage of total responses. The total number of tests used in the assessment was also recorded. For example, if 75 tests were used, this was reported as `N=75'. The results of the tabulation(s) can be seen as a PDF file in the `Related Documents'.  For SLO 2 in Fall 2011, one question was selected from each of the three midterm exams (`E1', `E2', and `E3'), and two questions were selected from the final exam. On E1, the students were asked to imagine that they were examining some ancient rocks, and those rocks have undergone intense chemical weathering. What would best describe the environment in which this weathering occurred? 56 percent of students chose the correct response (an environment with a lot of water), 10 percent chose the `almost' response (a wet, but *cold* environment), and 34 percent chose one or the other of the bad responses (dry environments). On E2, students were asked about changes in the Earth system in this way: What events marked the boundaries between the Paleozoic and Mesozoic Eras, and between the Mesozoic and Cenozoic Eras? 61 percent of students selected the correct response (mass extinctions), 13 percent selected the `almost' response (mass extinctions, with one of the extinction dates wrong), and 26 percent selected one or the other of the bad responses (evolution of various traits that did not lead to mass extinctions). On E3, students were asked to choose what sort of data would best provide evidence for the changing relative positions of continents (i.e. continental drift) through time? 34 percent of students chose the correct answer (ancient, non-tilted lava flows in Antarctica, with horizontal	and both SLOs, a broad pattern exists for student performance on a typical 4-item multiple-choice question from an in-class exam: About 60 percent of the students choose the correct response, with the remainder of the chosen responses distributed pretty evenly between the three incorrect choices. This performance level thus represents a `baseline' from which improvements can be sought.  Examples of low and high success rates on SLO-assessment embedded questions can be drawn from a number of different parts of the `parameter space' represented by the overall pool of assessed questions. In some cases, students will succeed at an SLO by remembering key facts or data that they need in order to assess a hypothesis or track or predict some change in the Earth system. In other cases, the key facts are remembered less well, resulting in a lower success rate on the SLO. To the extent that this is correlated with subject matter, the most difficult `memory challenges' occur in the most complex subjects covered in Geology 10, particularly the subject of plate tectonics. This suggests that where the material involves a large number of details that have to be `kept straight', additional pedagogical emphasis is

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		paleomagnetic fields in them), 16 percent of students chose the `almost' answer (same, but with steeply-inclined fields), and 50 precent chose one or the other of the bad answers (various pieces of evidence for paleomagnetic reversals). On the final exam, the first question selected for assessment of SLO 2 concerned the fossil record. Students were asked why Precambrian rocks do not show much of a fossil record? 79 percent of students chose the correct response (organisms had not yet evolved hard skeletal parts), 3 percent chose the `almost' response (there were no more organisms with had skeletal parts, which is factually incorrect), and 18 percent chose one or the other of the two bad responses (non-factual claims about climate and sedimentation). The second question chosen from the final exam concerned ice ages. What was some of the original evidence for an ice age? 74 percent of students selected the correct choice (moraines far from present-day glaciers), 25 percent selected one or the other of the bad choices (factually incorrect accounts), and only 1 percent selected the`almost' choice (volcanic landforms that erupted through ice). (07/18/2012) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** E1: Although correct responses outnumbered bad responses by nearly 2-to-1, the percentage of correct responses could be higher. It is possible that students simply hadn't memorized enough facts about chemical weathering, or that they had trouble visualizing the environment at the Earth's surface changing through geologic time. Possible pedagogical responses might include changing the way this material is presented in lecture, or using a clicker question to emphasize this point, if the logistical and cost-to-students issues surrounding clickers can be fully settled. E2: Student success was fairly good on this question, although it would be desirable to improve the percentage of students choosing `mass extinctions'. This is a case where the students probably needed to simply have the relevant	needed. Students in Geology 10 face other challenges as well, such as interpreting visual cues from drawings, or visualizing scenarios described to them in words. This suggests that additional pedagogical emphasis may be needed for all forms of visualization and visual pattern recognition. Specific pedagogical actions can be undertaken to try and increase success rates on SLOs. The most attractive set of new teaching methods falls under the heading of `peer instruction'. Pioneered by instructors like Eric Mazur, a physics professor at Harvard, they involve students attempting to answer conceptual questions about the material, and then attempting to explain their answers to each other. Peer-instruction methods can take many forms, such as `think-pair-share' exercises, and the use of Personal Response System (`clickers'). Research by instructors like Mazur at Harvard, and a number of instructors in Geology and Astronomy at several universities, have demonstrated (through research and data) that peer-instruction methods can significantly enhance student understanding of material.

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		facts memorized better. The fact that the geological time scale is divided on the basis of events in the history of life, particularly mass extinctions, is probably less amenable to peer-instruction methods and critical-thinking exercises, compared to other aspects of SLO 2. This may be a case where students need better training in how to memorize relevant information. In-class training or homework training, such as by making study cards of the sort the instructor used in college, might be a worthwhile form of \`in-class study skills training'. E3: As has been noticed in the assessment of SLO 1, questions related to plate tectonics tend to have the lowest success rates in SLO 2 as well. This may be a case in which students generally have more difficulty understanding the many details of paleomagnetism and plate-tectonic theory than the instructor does. Plate tectonics, especially as it intersects with the various SLOs, may require special attention, either in the form of revised lectures, more lecture time, covering it earlier in the quarter, and/or the use of new pedagogical techniques, such as those that involve peer-instruction techniques. Final, first question assessed: Student success was quite good on SLO 2, at nearly 80 percent correct. This is a case where they seemed to remember the details of the \`Cambrian' explosion of life forms with hard skeletal parts, and its importance for the geological record. Although this is a \`success story' for SLO 2, it may be worth asking \`what made the students remember *this* part of the story better than, say the information about mass extinctions from the E2 question? Final, second question assessed: Student success on this question was quite good, with correct responses outnumbering the others by nearly 3 to 1. **Related Documents:**	The Geology department has already done research on these methods, and has made preliminary efforts to experiment with them. For example, in-class experiments have been done in Geology 10 to try and use the PSME Division's set of clickers in class. Thus far, these experiments have mostly involved trying to work out the *logistical* details of implementing systems like those used at other schools. Given the fact that De Anza College does not have graduate teaching assistants or other resources, such as a 4-year school might have, the implementation of peer-instruction methods can be difficult. Additionally, whereas a 4-year school might easily be able to ask its students to buy in-class tools like clickers, this would be a difficult thing to ask of our students. Thus, it has been necessary to experiment with the rather basic set of clickers available in the PSME Division. New ways of implementing this technology, in which the students do not buy or own their own clickers, are in the process of development. While technology like \`clickers' is only one example of peer-based instruction, it is generally hoped that experiments with peer instruction and related pedagogy can lead to greater student

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		Geol_10_SLO_2_Fall2011	success in the learning outcomes for Geology 10. Experiments with these methods over the next few years will hopefully yield data that can be compared with the 2010-2011 and 2011-2012 cycles for SLO 1 and SLO 2. (07/18/2012)
GEOL10_SLO_1 - Apply the principles of scientific methodology to evaluate hypotheses on how the earth works as an integrated system. **SLO Status:** Active **Planned Assessment Quarters:** 2010-11 2-Fall, 2010-11 3-Winter, 2010-11 4-Spring **Outcome Creation Date:** 07/15/2012	**Exam - Course Test/Quiz -** Questions from midterm exams and questions from final exam, selected for their relevance to SLO 1. **Target for Success:** 50% of students will get the correct answer for this question.	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met Assessment Data Summary, end of 2018-2019 Prepared by Marek Cichanski To assess GEOL10_SLO_1, I chose a multiple-choice question from the first (of three) midterm exams from my Geology 10 class. Background Information: My multiple-choice questions typically have four choices, one of which (the best answer) gets full points. There is usually a second-best choice, which gets about 3/4 of the full points, and two "wrong answer" choices that get 1/2 of the full points. This partial-credit system accomplishes roughly the same thing as "curving" the grades, while still using a fixed grading scale, and thus avoids putting the students in direct competition with each other for grades. This SLO concerns the Earth as a system, and this system has many components. The question I chose to assess this SLO dealt with the major compositional parts of the Earth system, namely its compositional layers. These are the core, mantle, and crust, which became separated from each other shortly after the Earth's formation, due to their different densities. The question asked students to choose the best description of the core, mantle, and crust, and the reason for their separation. The best answer was that the core is metal and is denser than the other layers, which are made of rock. 81% of students chose this answer. 4% of students chose the 2nd-best answer, which claimed the mantle is the metal layer, and 15% of students chose one of the wrong answers. (06/30/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The overall	**Enhancement:** It will be worth continuing to emphasize the model of the Earth that is presented at the beginning of the quarter. This may help students to achieve a reasonably high level of success on questions of this type, as they did in this case. (06/30/2019)

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		success rate for this question was good. Although it is impossible to know for sure what the students were thinking as they made their answer choices, it seems plausible that they had the correct mental model of the Earth in mind. This is emphasized early in the quarter, in the first lecture, and the first reading assignments. The differentiation of the Earth (i.e. its separation into layers based on density) is described by analogy to substances of different densities, like oil and vinegar.	
		Program Review Reporting Year: 2010-2011 **Target :** Target Met This SLO was assessed by tabulating the multiple-choice responses that the students selected on their tests. (The Parscore system made it possible to count how many students selected \`a', \`b', etc? for any given question.) For each test question used in the SLO assessment, there is a correct response, one or more \`bad' responses, and in most cases, an \`almost correct' response. Each question had four choices, total - one correct, two or three bad choices, and in most cases, one \`almost correct' choice.  Each test question that was chosen for SLO assessment was evaluated in the following way: The percentage of students choosing the \`correct', \`almost', and \`bad' choices were reported as a percentage of total responses. The total number of tests used in the assessment was also recorded. For example, if 75 tests were used, this was reported as \`N=75'.  The results of the tabulation(s) can be seen as a PDF file in the \`Related Documents'. The Spring 2011 class that was selected for SLO 1 assessment was a 30-person night class. One question was selected from each of the four graded items in the course: The three midterm exams (\`E1', \`E2', and \`E3'), and the final exam. On E1, students were asked what was the *early* evidence for organized atomic structure in crystals? The hypothesis	**Enhancement:** This is a generalized Action plan for Enhancement of student success in the Student Learning Outcomes for Geology 10. It is based on SLOAC results for one year of SLO 1 (2010-2011) and one year of SLO 2 (2011-2012). Averaged over two school years and both SLOs, a broad pattern exists for student performance on a typical 4-item multiple-choice question from an in-class exam: About 60 percent of the students choose the correct response, with the remainder of the chosen responses distributed pretty evenly between the three incorrect choices. This performance level thus represents a \`baseline' from which improvements can be sought.  Examples of low and high success rates on SLO-assessment embedded questions can be drawn from a number of different parts of the \`parameter space' represented by the overall pool of assessed questions. In some cases,

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		that crystals have such an atomic structure is a key part of an understanding of what terrestrial planets are made of, and in this question, students needed to distinguish between the *early* evidence, which suggests a hypothesis in the first place, and *later* evidence, which tests the hypothesis. 58 percent of student selected the correct choice (constancy of interfacial angles from crystal to crystal), 25 percent selected the `almost' choice (later evidence, such as from X-ray diffraction), and 17 percent of students selected one or another of the bad choices (other facts about minerals). On E2, the students were asked to imagine that they were discussing a desert landscape with a friend, such as that found in areas like Joshua Tree, where extremely large, rounded boulders are found. In the question, a friend suggests that the boulders were rounded by stream transport. What alternative hypothesis might be suggested? 95 percent of students gave the correct answer, than the boulders had been joint-bounded blocks whose corners and edges has been rounded off by chemical weathering while still buried under soil. On E3, students were asked to describe the new evidence that revived the hypothesis of continental drift, after it was dismissed in the early 20th century. Student responses were split (at 42 percent) between the correct choice (apparent polar-wander paths that didn't match from continent to continent) and the two bad choices. 16 percent of students chose the `almost' answer (data related to purported rotation of continents). On the final exam, the question selected for assessment of SLO 1 was similar to one used for W2011. Students were asked to imagine examining beds of sedimentary rock in widely separated areas. How might they test the hypothesis that the beds were deposited at the same time? Student responses were evenly split (at 42 percent) between the correct choice (same fossils in the two areas) and an `almost' choice (same rock types in the two areas). 16	students will succeed at an SLO by remembering key facts or data that they need in order to assess a hypothesis or track or predict some change in the Earth system. In other cases, the key facts are remembered less well, resulting in a lower success rate on the SLO. To the extent that this is correlated with subject matter, the most difficult `memory challenges' occur in the most complex subjects covered in Geology 10, particularly the subject of plate tectonics. This suggests that where the material involves a large number of details that have to be `kept straight', additional pedagogical emphasis is needed. Students in Geology 10 face other challenges as well, such as interpreting visual cues from drawings, or visualizing scenarios described to them in words. This suggests that additional pedagogical emphasis may be needed for all forms of visualization and visual pattern recognition. Specific pedagogical actions can be undertaken to try and increase success rates on SLOs. The most attractive set of new teaching methods falls under the heading of `peer instruction'. Pioneered by instructors like Eric Mazur, a physics professor at Harvard, they

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		percent of students selected the other `almost' choice (volcanic ash in the sediment), and no students selected the bad choice (rocks are metamorphosed). (07/18/2012) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** E1: Overall, students performed well on this question, selecting the correct choice by a more than 2-to-1 margin over the `almost' choice, and by a more than 3-to-1 margin over the aggregate of the bad choices. E2: Students overwhelmingly recalled the correct story that really explains the existence of large, rounded rock masses in desert areas. E3: As in Winter 2011, student success on SLO 1, in the topic area of plate tectonics, was not especially good. This may reflect the general complexity of the topic. Concepts such as paleomagnetism and apparent polar-wander paths are quite complex. It may be necessary to devote more time in lecture to these topics, and/or to do more hands-on exercises in lab, as well as possibly employing peer-instruction techniques, in which students would help each other clarify and reinforce their understanding. Final: The split between *fossil correlation* and correlation of lithologies suggests that the students might not have understood the importance of the principle of fossil succession. It may be worth clarifying this point in the lecture, and/or the peer-instruction techniques suggested above, for E3. **Related Documents:** Geol_10_SLO_1_Sp2011	involve students attempting to answer conceptual questions about the material, and then attempting to explain their answers to each other. Peer-instruction methods can take many forms, such as `think-pair-share' exercises, and the use of Personal Response System (`clickers'). Research by instructors like Mazur at Harvard, and a number of instructors in Geology and Astronomy at several universities, have demonstrated (through research and data) that peer-instruction methods can significantly enhance student understanding of material. The Geology department has already done research on these methods, and has made preliminary efforts to experiment with them. For example, in-class experiments have been done in Geology 10 to try and use the PSME Division's set of clickers in class. Thus far, these experiments have mostly involved trying to work out the *logistical* details of implementing systems like those used at other schools. Given the fact that De Anza College does not have graduate teaching assistants or other resources, such as a 4-year school might have, the implementation of peer-instruction methods can be difficult. Additionally, whereas a 4-year school might easily be able to

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
			ask its students to buy in-class tools like clickers, this would be a difficult thing to ask of our students. Thus, it has been necessary to experiment with the rather basic set of clickers available in the PSME Division. New ways of implementing this technology, in which the students do not buy or own their own clickers, are in the process of development. While technology like `clickers' is only one example of peer-based instruction, it is generally hoped that experiments with peer instruction and related pedagogy can lead to greater student success in the learning outcomes for Geology 10. Experiments with these methods over the next few years will hopefully yield data that can be compared with the 2010-2011 and 2011-2012 cycles for SLO 1 and SLO 2. (07/18/2012)
		Program Review Reporting Year: 2010-2011 **Target :** Target Met This SLO was assessed by tabulating the multiple-choice responses that the students selected on their tests. (The Parscore system made it possible to count how many students selected `a', `b', etc? for any given question.) For each test question used in the SLO assessment, there is a correct response, one or more `bad' responses, and in most cases, an `almost correct' response. Each question had four choices, total - one correct, two or three bad choices, and in most cases, one `almost correct' choice. Each test question that was chosen for SLO assessment was	**Enhancement:** This is a generalized Action plan for Enhancement of student success in the Student Learning Outcomes for Geology 10. It is based on SLOAC results for one year of SLO 1 (2010-2011) and one year of SLO 2 (2011-2012). Averaged over two school years and both SLOs, a broad pattern exists for student performance on a typical 4-item multiple-choice

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		evaluated in the following way: The percentage of students choosing the `correct', `almost', and `bad' choices were reported as a percentage of total responses. The total number of tests used in the assessment was also recorded. For example, if 75 tests were used, this was reported as `N=75'. The results of the tabulation(s) can be seen as a PDF file in the `Related Documents'.  Student response data were tabulated for all three midterm exams (`E1', `E2', and `E3'), as well as for two questions on the final exam. On E1, a question about mineral cleavage was assessed. The students were asked to imagine a friend who suggests that minerals are made of atoms arranged in organized patterns. (This is, in fact, true.) They were further asked to imagine that they, the students, have proposed breaking a mineral to check for cleavage. (This is, in fact, a good test of the friend's hypothesis.) Question: What is a `fool you' mineral that lacks cleavage? This question requires the students to know enough about minerals and their cleavage to avoid an important pitfall that might arise when testing the friend's hypothesis. Student responses were about equally split between the correct choice (quartz, 39 percent), the `almost' response (pyroxene, which rarely displays its cleavage characteristics well, 31 percent, and the two bad answers (feldspar, mica, which both show distinct cleavage). The selected question from E2 asked the students to try and imagine examining layers of sedimentary rock in widely-separated areas. How might they determine whether the layers in the two areas are of the same age? 60 percent of the students selected the best answer (finding index fossils), 32 percent chose the various bad answers, and only 6 percent chose the `almost' answer (finding fossils of organisms with hard skeletal parts).	question from an in-class exam: About 60 percent of the students choose the correct response, with the remainder of the chosen responses distributed pretty evenly between the three incorrect choices. This performance level thus represents a `baseline' from which improvements can be sought.  Examples of low and high success rates on SLO-assessment embedded questions can be drawn from a number of different parts of the `parameter space' represented by the overall pool of assessed questions. In some cases, students will succeed at an SLO by remembering key facts or data that they need in order to assess a hypothesis or track or predict some change in the Earth system. In other cases, the key facts are remembered less well, resulting in a lower success rate on the SLO. To the extent that this is correlated with subject matter, the most difficult `memory challenges' occur in the most complex subjects covered in Geology 10, particularly the subject of plate tectonics. This suggests that where the material involves a large number of details that have to be `kept straight', additional pedagogical emphasis is needed. Students in Geology 10 face other

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		On E3, the tabulated question asked the students what *new* evidence revived the debate over continental drift, after the hypothesis had been rejected in the early 20th century? In this case, 71 percent of students selected one or the other of the bad answers. 16 percent selected the `almost' answer, and only 13 percent selected the correct answer (apparent polar-wander paths that did not match from continent to continent). The first tabulated question from the final exam asked the students to imagine examining an outcrop of igneous rock. What would constitute good evidence for an *intrusive* origin of the igneous rock? 64 percent of students selected the correct answer (an igneous dike cutting across other rocks), 31 percent selected one or the other of the bad answers (descriptions of sedimentary rocks), and only 5 percent selected the `almost' answer. The second tabulated question from the final exam asked the students to imagine examining a tilted sequence of sedimentary beds. What might indicate that the beds were overturned, if such were the case? Student responses were split evenly between the correct answer (downward-fining in a sandstone bed) and the three bad answers (descriptions of sedimentary structures in *upright* orientations). (07/18/2012) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** E1: It would be desirable to see more students select the correct answer. This is a case in which the students needed to have done some straightforward memorization, and less than half of them memorized the information correctly. Improving performance on this aspect of SLO 1 will probably involve finding ways to motivate the students to do a better job of the `memorization' part of their studying. E2: By choosing the correct answer 2-to-1 over the aggregate of both bad answers, students succeeded pretty well at SLO 1 in this case.	challenges as well, such as interpreting visual cues from drawings, or visualizing scenarios described to them in words. This suggests that additional pedagogical emphasis may be needed for all forms of visualization and visual pattern recognition. Specific pedagogical actions can be undertaken to try and increase success rates on SLOs. The most attractive set of new teaching methods falls under the heading of `peer instruction'. Pioneered by instructors like Eric Mazur, a physics professor at Harvard, they involve students attempting to answer conceptual questions about the material, and then attempting to explain their answers to each other. Peer-instruction methods can take many forms, such as `think-pair-share' exercises, and the use of Personal Response System (`clickers'). Research by instructors like Mazur at Harvard, and a number of instructors in Geology and Astronomy at several universities, have demonstrated (through research and data) that peer-instruction methods can significantly enhance student understanding of material. The Geology department has already done research on these methods, and has made

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		E3: Clearly, the subject of plate tectonics is sufficiently complicated and detailed that students stand a fair chance of not succeeding at SLO 1. It is probably worth examining how the lectures are structured and presented, and considering using newer pedagogical methods, such as those described under the category of `peer instruction'. Final, question 1: By choosing the correct answer 2-to-1 over the aggregate of both bad answers, students succeeded pretty well at SLO 1 in this case. Final, question 2: It seemed clear from the 50-50 split between correct and incorrect answers that the students had not done a sufficient job of `keeping straight' the details about sedimentary structures, and/or they had not correctly visualized the problem. Possible ways of improving performance on this type of question might include giving them practice work of some sort, such as making drawings of sedimentary structures in tilted sequences of beds, and exchanging them with other students to analyze and interpret. **Related Documents:** Geol_10_SLO_1_W2011	preliminary efforts to experiment with them. For example, in-class experiments have been done in Geology 10 to try and use the PSME Division's set of clickers in class. Thus far, these experiments have mostly involved trying to work out the *logistical* details of implementing systems like those used at other schools. Given the fact that De Anza College does not have graduate teaching assistants or other resources, such as a 4-year school might have, the implementation of peer-instruction methods can be difficult. Additionally, whereas a 4-year school might easily be able to ask its students to buy in-class tools like clickers, this would be a difficult thing to ask of our students. Thus, it has been necessary to experiment with the rather basic set of clickers available in the PSME Division. New ways of implementing this technology, in which the students do not buy or own their own clickers, are in the process of development. While technology like `clickers' is only one example of peer-based instruction, it is generally hoped that experiments with peer instruction and related pedagogy can lead to greater student success in the learning outcomes for Geology 10. Experiments with these methods over the next few

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			years will hopefully yield data that can be compared with the 2010-2011 and 2011-2012 cycles for SLO 1 and SLO 2. (07/18/2012)
		Program Review Reporting Year: 2011-2012 **Target :** Target Met This SLO was assessed by tabulating the multiple-choice responses that the students selected on their tests. (The Parscore system made it possible to count how many students selected `a', `b', etc? for any given question.) For each test question used in the SLO assessment, there is a correct response, one or more `bad' responses, and in most cases, an `almost correct' response. Each question had four choices, total - one correct, two or three bad choices, and in most cases, one `almost correct' choice.  Each test question that was chosen for SLO assessment was evaluated in the following way: The percentage of students choosing the `correct', `almost', and `bad' choices were reported as a percentage of total responses. The total number of tests used in the assessment was also recorded. For example, if 75 tests were used, this was reported as `N=75'.  The results of the tabulation(s) can be seen as image files in the `Related Documents'. For the question used in this assessment, about half of the students selected the correct answer, and about half selected incorrect answers. (07/17/2012) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The question used in this assessment required the students to envision testing a hypothesis. They are presented with the hypothesis that a particular rock sample is a metamorphic rock called *schist*, which forms when pre-existing rock (typically shale or mudstone) is exposed to high heat and pressure in the roots of a developing mountain range. What observable characteristics should the sample show, if it is in fact schist? It should show a foliation defined by aligned	**Enhancement:** Enhancement / Action: This is a generalized Action plan for Enhancement of student success in the Student Learning Outcomes for Geology 10. It is based on SLOAC results for one year of SLO 1 (2010-2011) and one year of SLO 2 (2011-2012). Averaged over two school years and both SLOs, a broad pattern exists for student performance on a typical 4-item multiple-choice question from an in-class exam: About 60 percent of the students choose the correct response, with the remainder of the chosen responses distributed pretty evenly between the three incorrect choices. This performance level thus represents a `baseline' from which improvements can be sought.  Examples of low and high success rates on SLO-assessment embedded questions can be drawn from a number of different parts of the `parameter space' represented by the overall pool of assessed questions. In some cases, students will succeed at an SLO by remembering key facts or data

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		mica crystals. **Related Documents:** Geol10_SLO_1_F2010_E2	that they need in order to assess a hypothesis or track or predict some change in the Earth system. In other cases, the key facts are remembered less well, resulting in a lower success rate on the SLO. To the extent that this is correlated with subject matter, the most difficult `memory challenges' occur in the most complex subjects covered in Geology 10, particularly the subject of plate tectonics. This suggests that where the material involves a large number of details that have to be `kept straight', additional pedagogical emphasis is needed. Students in Geology 10 face other challenges as well, such as interpreting visual cues from drawings, or visualizing scenarios described to them in words. This suggests that additional pedagogical emphasis may be needed for all forms of visualization and visual pattern recognition. Specific pedagogical actions can be undertaken to try and increase success rates on SLOs. The most attractive set of new teaching methods falls under the heading of `peer instruction'. Pioneered by instructors like Eric Mazur, a physics professor at Harvard, they involve students attempting to answer conceptual questions

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			about the material, and then attempting to explain their answers to each other. Peer-instruction methods can take many forms, such as `think-pair-share' exercises, and the use of Personal Response System (`clickers'). Research by instructors like Mazur at Harvard, and a number of instructors in Geology and Astronomy at several universities, have demonstrated (through research and data) that peer-instruction methods can significantly enhance student understanding of material. The Geology department has already done research on these methods, and has made preliminary efforts to experiment with them. For example, in-class experiments have been done in Geology 10 to try and use the PSME Division's set of clickers in class. Thus far, these experiments have mostly involved trying to work out the *logistical* details of implementing systems like those used at other schools. Given the fact that De Anza College does not have graduate teaching assistants or other resources, such as a 4-year school might have, the implementation of peer-instruction methods can be difficult. Additionally, whereas a 4-year school might easily be able to ask its students to buy in-class tools like clickers, this would be a

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			difficult thing to ask of our students. Thus, it has been necessary to experiment with the rather basic set of clickers available in the PSME Division. New ways of implementing this technology, in which the students do not buy or own their own clickers, are in the process of development. While technology like `clickers' is only one example of peer-based instruction, it is generally hoped that experiments with peer instruction and related pedagogy can lead to greater student success in the learning outcomes for Geology 10. Experiments with these methods over the next few years will hopefully yield data that can be compared with the 2010-2011 and 2011-2012 cycles for SLO 1 and SLO 2. (07/18/2012)
		Program Review Reporting Year: 2010-2011 **Target :** Target Met Question 1 (data from 12 students): Correct choice: 58 percent Almost-correct choice: 25 percent Incorrect choices: 17 percent Question 2 (data from 24 students): Correct choice: 96 percent Almost-correct choice: 4 percent Incorrect choices: 0 percent Question 3 (data from 19 students):	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		Correct choice: 42 percent Almost-correct choice: 16 percent Incorrect choices: 42 percent Question 4 (data from 24 students): Correct choice: 42 percent Almost-correct choice 1: 42 percent Almost-correct choice 2: 16 percent Incorrect choice: 0 percent (05/01/2012) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** As this was the first SLO assessed by the department, the assessment data have been examined for a baseline of target success date. The first fact that is apparent in the data is that success percentages can vary greatly. In the case of Question 2, virtually the entire class recognized the correct alternative hypothesis. For the other questions, slightly more or less than half of the class chose the best answer, with most of the remaining students choosing the `almost correct' answer.  This raises a number of interesting questions regarding how student success on SLO tasks may arise. While the SLOs are designed to be represent important cognitive skills, it is always possible for `skill acquisition' to be mimicked by `learning a story'. It is possible that in the case of some or all of these questions, the `story' behind how scientists figured out the relevant portion of the Earth system might have been more or less memorable for students. This could, in turn, depend on how the material was presented in class.	
GEOL10_SLO_3 - Use observations from the crust and lithosphere of the Earth to determine geologic history at hand-sample, outcrop, local, and regional scales. **SLO Status:** Active	**Exam - Course Test/Quiz -** Embedded Assessment: Questions will be chosen from exams, which are relevant to SLO 3 for Geology 10. **Target for Success:** 50% of students answering this question select the correct multiple-choice answer.	**Program Review Reporting Year:** 2018-2019 **Target :** Target Met Assessment Data Summary, end of 2018-2019 Prepared by Marek Cichanski To assess GEOL10_SLO_3, I chose a multiple-choice question from the second (of three) midterm exams from my Geology 10 class. Background Information: My multiple-choice questions	**Enhancement:** It could be argued that the reasonably high success rate for this question reinforces the need to go over examples in lecture, as well as in lab. If time permitted, even more examples could be provided to the students - perhaps as anonymous in-class

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		typically have four choices, one of which (the best answer) gets full points. There is usually a second-best choice, which gets about 3/4 of the full points, and two "wrong answer" choices that get 1/2 of the full points. This partial-credit system accomplishes roughly the same thing as "curving" the grades, while still using a fixed grading scale, and thus avoids putting the students in direct competition with each other for grades. This SLO is concerned with determining geologic history from evidence such as would be collected by a geologist doing field work. On the second midterm, I asked the students a "slide question", in which they were shown a view of a portion of the Grand Canyon. They had to choose the statement that best describes the geologic sequence of events that led to the scene shown in the slide. Historical interpretation of this type often includes the identification of features called "unconformities", which represent time gaps in the geologic record, usually due to erosion. The correct answer was one in which the students recognized an unconformity between the tilted and beveled Hakatai shale and the flat-lying Tapeats sandstone above it. 73% of students picked the best answer, and the remaining 27% of students picked one of the three wrong answers. (There was no "2nd-best" answer in this case.) (06/30/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Students did reasonably well on this question. They had been given examples of unconformities in the textbook and in lecture, and we had gone through some whole-class problem-solving examples of them in the lecture class. Additionally, they had been given exercises of this type in the laboratory portion of the class.	voting questions - to try and get the success rate even higher. (06/30/2019)
		Program Review Reporting Year: 2018-2019 **Target :** Target Met To assess this SLO in Fall 2018, a multiple-choice question from the final examination was selected. The question asked how a geologist might determine whether two widely-separated sequences of sedimentary rocks are the same age or not. (Answer: Look for the same assemblage of fossils in each sequence.) This type of geologic evaluation,	**Enhancement:** Piecing together the geologic history of an area can be broken down into sub-tasks, like the one in the question that was assessed. It might be useful for the students to perform more examples of these sub-tasks, as a form of practice question and,

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		called correlation, is integral to the process of working out the geologic history of a portion of the Earth's crust. Of the 45 students who took the exam, 68% of them answered the question correctly. (03/20/2019) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** It was good to see that the percentage of students correctly answering the question exceeded the target percentage. Naturally, of course, it would be desirable to try and increase that percentage if possible.	more generally, as a type of formative assessment during class time. This might be done by posing sample questions to the class and collecting real-time anonymous responses with some type of in-class anonymous voting system. (03/20/2019)
		Program Review Reporting Year: 2012-2013 **Target :** Target Met Selected Question: Students were asked to evaluate the selection of a site on a glacier where they could find the oldest ice. (04/22/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 32 out of 52 students answered this question correctly. It appears that a reasonably large number of students remembered and were able to apply a mental model of the flow pattern in a glacier.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Not Met Selected Question: If you found an ophiolite, what does this imply about the geologic history of the region in question? (Answer: The ophiolite represents an ocean basin that was closed by plate collision.) (04/22/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 14 out of 52 students answered this question correctly. This may be due to the complex nature of how ophiolite complexes form. Alternatively, it may be due to the counterintuitive nature of ophiolites, since they are ocean-crustal rock exposed on land.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Met Selected Question: Students were presented with a scenario in which they are examining an outcrop with more than one rock type, including igneous rock. To interpret part of the history of this part of the Earth's crust, students have to predict the type of evidence they might see that would imply an intrusive origin for the igneous rock. (Answer: It is	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		a dike, which cuts across older rock layers.) (04/22/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 53 out of 69 students answered the question correctly. This seems to suggest that a reasonably large fraction of the students were able to remember and apply the principle of relative dating.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Not Met Selected Question: Students were asked to imagine that they were examining an outcrop of blueschist (an exotic high-pressure, low-temperature metamorphic rock). What is the geohistorical significance of the fact that this rock, which formed underground, is exposed at the Earth's surface? (Answer: Uplift and erosion has exposed the rocks after they formed.) (04/22/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 33 out of 70 students answered this correctly. This is below the 50% target threshold set for the first SLOAC / PLOAC cycle. The relatively low success rate for this question may be due to the fact that blueschist is an exotic type of metamorphic rock that is only briefly discussed in class.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Met Selected Question: Students were asked to imagine looking at a layer of sandstone that has been tilted more than 90 degrees, and evaluate the type of evidence that would be required in order to determine that more than 90 degrees of tilting had taken place. (Answer: Graded beds in which the grains get smaller downward, instead of upward as is the usual pattern.) (04/22/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 28 out of 52 students answered this question correctly. This is just over the 50% criterion selected for the first SLOAC / PLOAC cycle. It appears that it is challenging for students to visualize the appearance of a sedimentary structure after more than 90 degrees of rotation.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Not Met Selected Question: Students were asked to imagine looking	

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		at a layer of sandstone that has been tilted more than 90 degrees, and evaluate the type of evidence that would be required in order to determine that more than 90 degrees of tilting had taken place. (Answer: Graded beds in which the grains get smaller downward, instead of upward as is the usual pattern.) (04/22/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 34 out of 69 students answered this question correctly. This is just under the 50% criterion selected for the first SLOAC / PLOAC cycle. It appears that it is challenging for students to visualize the appearance of a sedimentary structure after more than 90 degrees of rotation.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Met Selected Question: In addition to the `fits' between the continents on either side of the Atlantic, what evidence did Wegener use to support his hypothesis of continental drift? (Answer: Late Paleozoic [and older] geology) (04/22/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 53 out of 61 students answered this question correctly, showing that a reasonable number of them were able to evaluate what kind of evidence would be suitable for supporting the hypothesis of continental drift.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Met Selected Question: Students were given a description of a sedimentary rock layer, which sits unconformably on metamorphic basement rock, with both units cut by an igneous dike. The students had to use the ages of the metamorphic rock and the dike to constrain the age of the sedimentary rock. (04/22/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 48 out of 52 students answered this question correctly. This shows that most students were able to determine which rock unit is older (or younger) than another unit, based on the contact relationships between the units.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Met Selected Question: Students were given a description of a	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		sedimentary rock layer, which sits unconformably on metamorphic basement rock, with both units cut by an igneous dike. The students had to use the ages of the metamorphic rock and the dike to constrain the age of the sedimentary rock. (04/22/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 64 out of 70 students answered this question correctly. This shows that most students were able to determine which rock unit is older (or younger) than another unit, based on the contact relationships between the units.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Met Selected Question: Students were asked what are the implications of visible, eroded edges of layers of sedimentary rock. (Answer: Erosion has occurred after the layers were deposited.) (04/22/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 46 out of 52 students answered this question correctly. It appears that a reasonable number of students can apply Steno's 3rd principle (sometimes called `Original Lateral Continuity' or `Concealed Stratification') to envision one or more geologic events that occurred AFTER a rock unit formed.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Met Selected Question: Students were asked what are the implications of visible, eroded edges of layers of sedimentary rock. (Answer: Erosion has occurred after the layers were deposited.) (04/22/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 55 out of 70 students answered this question correctly. It appears that a reasonable number of students can apply Steno's 3rd principle (sometimes called `Original Lateral Continuity' or `Concealed Stratification') to envision one or more geologic events that occurred AFTER a rock unit formed.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Met Selected Question: Students were told to imagine that they were hiking in a small mountain range in Washington State called the Goat Rocks, made of lava flows and deposits of	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		volcanic ash. They were asked to interpret what this area looked like before extensive erosion. Answer: A stratovolcano, like nearby Mt. Rainier. (04/22/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 45 out of 69 students correctly answered this question. It appears that a reasonable number of students can extrapolate from a description of the present scene to a plausible picture of the landscape at an earlier point in its history.	
		Program Review Reporting Year: 2012-2013 **Target :** Target Met Selected Question: Students were told to imagine that they were hiking in a small mountain range in Washington State called the Goat Rocks, made of lava flows and deposits of volcanic ash. They were asked to interpret what this area looked like before extensive erosion. Answer: A stratovolcano, like nearby Mt. Rainier. (04/22/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 59 out of 76 students correctly answered this question. It appears that a reasonable number of students can extrapolate from a description of the present scene to a plausible picture of the landscape at an earlier point in its history.	
GEOL10_SLO_4 - Apply scientific methodology and geologic principles to analyze the impact of the Earth system on humanity, from specific natural hazards and the availability, use, and distribution of Earth resources. **SLO Status:** Active **Planned Assessment Quarters:** 2013-14 2-Fall, 2013-14 3-Winter	**Exam - Course Test/Quiz -** Embedded Assessment: Questions will be chosen from exams, which are relevant to SLO 3 for Geology 10. **Target for Success:** 50% or more of students will answer this question correctly.	**Program Review Reporting Year:** 2018-2019 **Target :** Target Not Met Assessment Data Summary, end of 2018-2019 Prepared by Marek Cichanski To assess GEOL10_SLO_4, I chose a multiple-choice question from the first (of three) midterm exams from my Geology 10 class. Background Information: My multiple-choice questions typically have four choices, one of which (the best answer) gets full points. There is usually a second-best choice, which gets about 3/4 of the full points, and two "wrong answer" choices that get 1/2 of the full points. This partial-credit system accomplishes roughly the same thing as "curving" the grades, while still using a fixed grading scale, and thus avoids putting the students in direct competition with each other for grades. This SLO is concerned with using geologic principles to	**Enhancement:** The best thing I can think of would be to give the students several example problems, perhaps in the form of a series of in-class anonymous voting questions, or perhaps in the form of a take-home, multiple-choice worksheet. (06/30/2019)

identify geologic hazards and resources. The question that I chose to assess this SLO asked the students to look at a hypothetical geologic cross-section and choose which (of four possible underground locations) would be the best drilling target for oil. 54% of students chose the best target, 15% chose the second-best target, and 31% chose one of the wrong answers. (06/30/2019)
Reflection (CLICK ON ? FOR INSTRUCTIONS): I was surprised that more students did not choose the correct drilling target. The problem used on the test was very similar to the example that we went over in the lecture on oil geology.

Program Review Reporting Year: 2013-2014
Target : Target Met
When exploring for oil or natural gas, why would a heavily quartz-cemented sandstone make a poor reservoir rock? (Answer: The quartz cement fills the pore spaces too thoroughly, reducing the rock's ability to hold fluids.) (04/23/2014)
Reflection (CLICK ON ? FOR INSTRUCTIONS): 38 out of 45 students answered this question correctly. A large fraction of students were able to answer a relatively complicated, hypothetical `application' question, based on basic knowledge of how reservoir rocks work.

Program Review Reporting Year: 2013-2014
Target : Target Not Met
Selected Question: During a Bay Area earthquake, if the rocks begin breaking underneath Cupertino, where is the epicenter? (Answer: Cupertino) (04/23/2014)
Reflection (CLICK ON ? FOR INSTRUCTIONS): 15 out of 45 students answered this question correctly. The low percentage of correct answers is puzzling in this case. Although the students were presented with the correct information about the definition of an epicenter, they were largely unable to recognize such a scenario in a list. This shows that what seems like straightforward application of knowledge can be more complicated than initially expected.

Program Review Reporting Year: 2013-2014

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		Target : Target Met During a Bay Area earthquake (or any earthquake), what are the characteristics of an aftershock? (Answer: An aftershock is a separate earthquake, with its own P, S, and surface waves.) (04/23/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 26 out of 42 students answered this question correctly. A reasonable number of them were able to distinguish an aftershock from one of the individual wave onsets (such as the onset of the P or S waves).	
		Program Review Reporting Year: 2013-2014 **Target :** Target Met What does the sediment that makes up a typical oil reservoir rock look like before it gets lithified into rock? (Answer: Grains of sand) (04/23/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 23 out of 44 students answered this question correctly. This was barely above the first-SLOAC-cycle baseline target of 50% correct. This suggests a problem in the separation of variables: What, specifically, might have caused relatively few students to select the correct answer? Difficulty remembering the relevant facts? The fact that they were being asked to envision a prior-history scenario that no one was around to see?	
		Program Review Reporting Year: 2013-2014 **Target :** Target Met Selected Question: If it were possible to alter the characteristics of a lava being erupted by a volcano (it's not), what alteration would make an eruption like the 1980 eruption of Mt. St. Helens LESS explosive? (Answer: A reduction in the silica content of the lava) (04/23/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 37 out of 45 students answered this question correctly. It appears that a reasonably large proportion of students were able to apply basic knowledge (of the influence of silica content on magma viscosity) to a hypothetical scenario.	
		Program Review Reporting Year: 2013-2014 **Target :** Target Met Selected Question: If one wants to build a house with a view	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		of a stratovolcano like Mt. Etna or Mt. St. Helens, what should one consider doing? (Answer: Building at a considerable distance from the volcano, to reduce hazards from lahars and pyroclastic flows.) (04/23/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 38 out of 45 students answered this question correctly. This seems to show that a reasonably fraction of students can recognize volcanic hazards and evaluate strategies for minimizing them.	
		Program Review Reporting Year: 2013-2014 **Target :** Target Met Selected Question: Imagine that your water well runs dry. How might your neighbor (who has installed a well that pumps at a very high flow rate) have caused this? (Answer: Their well has caused a cone of depression in the water-table surface, causing the water table to drop below the bottom of your well.) (04/23/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 23 out of 33 students answered this question correctly. The relevant material is covered near the end of the quarter. This raises the interesting possibility that students might have an easier time remembering and applying concepts that were covered recently. Such a conclusion is not certain, however, since other assessments of this SLO have had high success rates (e.g. question about volcanic hazards), despite coming from the beginning of the quarter.	
		Program Review Reporting Year: 2013-2014 **Target :** Target Met Selected Question: From a list of possible hazards, which ones are likely to come from a stratovolcano? (Answer: Lahars and pyroclastic flows) (04/23/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 30 out of 33 students answered this question correctly. It is possible that the vivid nature of volcanic hazards, and/or their direct bearing on human life and safety, may have made this material easier to remember and this question easier to answer correctly.	
		Program Review Reporting Year: 2013-2014 **Target :** Target Met	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		Selected Question: In a case of groundwater contamination, such as from leaking underground gasoline storage tanks, how can the groundwater be cleaned most effectively? (Answer: By drilling wells and pumping & treating the groundwater.) (04/23/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 25 out of 33 students answered this question correctly. In this case, answering this question may have been a fairly straightforward matter of factual recall, by remembering the lecturer's description of how he participated in this sort of work during a job he held between college and graduate school. This raises the interesting question of whether or not a topic can be understood and remembered more effectively if it can be related to personal experience.	
		Program Review Reporting Year: 2013-2014 **Target :** Target Not Met Selected Question: Students were asked what caused flooding by water, mud, and sand (that came up out of the ground) during the 2011 earthquakes in Christchurch, New Zealand. (Answer: Liquefaction of soil due to strong ground shaking.) (04/23/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 19 out of 67 students answered this question correctly. In this case, the low percentage of correct responses may not be as much a matter of pedagogical approach as simply a matter of not having covered the Christchurch example in much detail. This was an example of an item from the course's `What2Know' list that was briefly described in the book, but not in the lecture. Although not all topics from the `What2Know' list can be discussed in detail in class, such coverage probably increases the number of students who will get a question correct.	
		Program Review Reporting Year: 2013-2014 **Target :** Target Met Selected Question: Students were given a set of geologic factors that might conceivably affect the development of an oil field. They had to assess the relative importance of these factors, and select the one that is NOT important for forming an economical deposit of hydrocarbons. (Answer: Heating by a plutonic intrusion) (04/23/2014)	

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		Reflection (CLICK ON ? FOR INSTRUCTIONS): 47 out of 70 students answered this question correctly. Although the percentage would ideally be higher, it shows that at least some of the students were able to integrate ideas from other portions of the course (such as the section on metamorphism) into an analysis of the factors necessary for generating oil and gas.	
		Program Review Reporting Year: 2013-2014 **Target :** Target Met Selected Question: When trying to extract oil using the new technique of hydrofracturing, is limestone a good target rock? (Answer: No, because it's not a typical hydrocarbon source rock.) (04/23/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Starting in Fall 2013, the Geology lecture about the geology of oil and natural gas was modified to include a discussion of new oil-extraction techniques. 48 out of 70 students answered this question correctly, showing that a reasonable number of them can use their knowledge of these new techniques to select a suitable drilling target, as though they were oil-exploration geologists.	
		Program Review Reporting Year: 2013-2014 **Target :** Target Met Selected Question: Why is a pyroclastic flow so hazardous? Students were expected to be able to evaluate and select the correct reason why this volcanic hazard is so significant. (Answer: It is a mixture of hot volcanic ash and hot volcanic gases.) (04/22/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** 46 out of 76 students answered this question correctly. It appears that a reasonable number of students were able to recall the details of what a pyroclastic flow is and why it represents a significant hazard.	

GEOL 20:General Oceanography

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
GEOL20_SLO_1 - Apply the principles of scientific methodology to test hypotheses as to how the Earth's oceans work as an integrated system. **SLO Status:** Active	**Exam - Course Test/Quiz -** Objective testing of student's ability to recognize scientific methodology in posed situations in general that later can be related to natural systems such as Earth's oceans. Sample Questions from Subject Mastery Tests The following questions have been extracted from Subject Mastery Tests and mapped onto course SLOs in General Oceanography. They are representative of questions asked in each of the classes during the terms examined. Science and the Scientific Method Basic Knowledge & General Understanding Questions 1 through 5: Multiple Choice: "Mental Warm Up" 1. Two fellow students in a humanities class on campus notice that their professor glares every time he sees the young woman in the front row texting beneath her desk. Taking notice of the professor's response to the young woman's behavior would be an example of a (n): a. experiment b. theory c. hypothesis d. observation e. scientific law or principle		

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	2. The same young woman sits in the front row of a history class, which is also attended by your two friends. They notice in this class as well her history professor seems upset with her when she uses her cell phone beneath her desk to text. Noticing that other people in the back row are texting as well, they conclude that the professors just have it "out for this student." Your friends' conclusion would be an example of a(n): a. experiment b. theory c. hypothesis d. observation e. scientific law or principle 3. Your friends decide to test their conclusion by looking at the young woman's test scores from these two classes. As a control, they decided to ask the other students in the front rows about their grades as well. This test of their conclusion is a(n): a. experiment b. theory c. hypothesis d. observation e. scientific law or principle 4. The data showed that every single person sitting in the front row of each of these classes received an "A" on the first test. The young woman was given an "F" by both instructors. Your friends felt		

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
	vindicated as the results of their work supports their conclusion that the two professors are “out to get this young woman.” The method employed to consider whether or not the two professors were biased against this student: a. is an example of thinking by imitation. b. is based on faith. c. is an example of scientific methodology. d. is an example of argumentative reasoning. 5. Hint to question 4 above, does scientific methodology guarantee a correct answer? a. YES b. NO **Target for Success:** In statistical analysis of correct responses, students answering these kinds of situational questions regarding scientific methodology are expected to exceed a mastery of over 80%. **Comments/Notes:** Questions are similar from term to term but not the same. The idea is to get students to first familiarize themselves with recognizing scientific methodology in more familiar situations before applying that understanding to the ocean system. **Related Documents:** G20_SLO_assessment01.docx		
GEOL20_SLO_2 - Use observations	**Exam - Course Test/Quiz -** Objective		

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
and data to characterize the dynamic Earth processes that act to shape the ocean floor and analyze the record of these processes within marine sediments and oceanic crust. **SLO Status:** Active	testing questions of multiple types are used in course Subject Mastery Test. Examples of questions covering SLO_2 are shown can be found in the attached document along with analysis of three terms of testing. **Target for Success:** Target for success for this SLO is 75% for student populations active in GEOL 20 classes. **Related Documents:** G20_SLO_assessment01.docx		
GEOL20_SLO_3 - Analyze the dynamic movement of the water column of the oceans, through an application of the physical principles of ocean currents, waves, and tides and their effect on coastal systems and processes. **SLO Status:** Active	**Exam - Course Test/Quiz -** Objective testing questions of multiple types are used in course Subject Mastery Test. Examples of questions covering SLO_3 are shown can be found in the attached document along with analysis of three terms of testing. **Target for Success:** Target for success for the GEOL 20 student population participating in Subject Mastery Testing is 75%. **Related Documents:** G20_SLO_assessment01.docx		
GEOL20_SLO_4 - Apply scientific methodology and the principles of oceanography to analyze the impact of the ocean system on humanity, from specific natural hazards and the availability, use, and distribution of ocean resources. **SLO Status:** Active	**Exam - Course Test/Quiz -** Objective testing questions of multiple types are used in course Subject Mastery Test. Examples of questions covering SLO_4 can be found in the attached document along with analysis of three terms of testing. **Target for Success:** Target for success of GEOL 20 students participating in Subject Mastery		

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	Testing is 75% accurate responses to test questions. **Comments/Notes:** Attachment shows only a small sample of questions in this area related to coastal hazards. This SLO area has multiple assessment strategies in place. **Related Documents:** G20_SLO_assessment01.docx **Laboratory Project -** This is a field project done by oceanography students using parts of the San Mateo County Coast as a natural field laboratory. Students are given an assignment to consider natural beach processes as these impact human habitation of the California Coast. Project is turned in and reviewed for accuracy of measurements and for clarity of conclusions and application to material learned in the third unit of the oceanography course. **Target for Success:** It is expected that 90% of the student population demonstrate a knowledge of coastal processes and the impact of these processes on coastal habitation, within the specific requirements of the activity. **Related Documents:** Introductory Coastal Workshop		

Assessment: Course/Service Four Column

Dept - (PSME) Meteorology

MET 10:Weather and Climate Processes

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MET10_SLO_1 - Analyze and explain the objective techniques used by synoptic meteorologists and climatologists to forecast our planet's weather and to predict future changes in our planet's climate. . **SLO Status:** Active	**Exam - Course Test/Quiz -** Test Questions - 10 SLOAC Assessment Questions incorporated into final exam. **Target for Success:** Target is 85% accuracy	**Program Review Reporting Year:** 2011-2012 **Target :** Target Met Question 5 - 91% Question 6 - 98% Question 7 - 98% Question 9 - 98% Question 16 - 100% Average = 97% (01/09/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Target met. Course is an introductory physical sciences survey course. It is designed to stimulate interest in the sciences by focusing on student success.	
	Exam - Course Test/Quiz - Written Question included on Midterm Exam. **Target for Success:** 80% of students who attempt the question will earn a score of 7 or higher out of 10	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met The Assessment was given in 2 sections of Met 10. One face-to-face section and the other section was online Results: 22 of 26 (84.6%) were successful (02/20/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Target was met.	**Enhancement:** Incorporate more discussion activities in both face-to-face and online sections that allow students to openly evaluate measurement and forecast techniques used by meteorologists. (02/20/2018)
		Program Review Reporting Year: 2017-2018 **Target :** Target Not Met Online: 40 of 51 (78.4%) were successful (02/20/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** We felt that the primary reason why the target was not met was because of a lack of active discussion regarding the	**Enhancement:** Incorporate additional discussion questions regarding objective forecasting techniques into online assignments. (03/06/2018)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
		objective techniques used. The techniques were presented primarily through video lectures without any real dialogue on why they are necessary.	
	Exam - Course Test/Quiz - Mid-term Exam Question - “Tightly packed isobars produce _____ pressure gradient forces and _____ winds.” **Target for Success:** 80% of Students will answer this question correctly.	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met 92% of students answered this question correctly. (02/12/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The target was met.	**Enhancement:** While the target was met, there is still room for improvement. Enhancements will include additional discussion of isobar analysis and the pressure gradient force. (05/02/2018)
	Exam - Course Test/Quiz - Final Exam Question – “At what time of day is an air mass thunderstorm more likely to develop?” **Target for Success:** 80% of students will answer this question correctly	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met 98% of students answered this question correctly. (03/26/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Target Met.	**Enhancement:** While the target was met, not everyone correctly answered the question. Enhancements will include additional activities identifying and distinguishing different types of thunderstorms. (05/02/2018)
MET10_SLO_2 - Assess and critique the impact of meteorology and climatology as sciences on local, national and international economic, environmental, ethical and political issues including climate change. **SLO Status:** Active	**Exam - Course Test/Quiz -** Test Questions - 10 SLOAC Assessment Questions incorporated into final examination for the course. Questions 22,31 32, 34 and 43 for SLOAC 2. **Target for Success:** Target is 85% accuracy.	**Program Review Reporting Year:** 2011-2012 **Target :** Target Met Question 22 = 98% Question 31 = 96% Question 32 = 97% Question 34 = 97% Question 43 = 50% Average is 87% (01/09/2014) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Target met. Course is an introductory level physical sciences survey course. It is designed to stimulate interest in the sciences by focusing on student success.	
	Project - An in-class group assignment where students answer questions explaining the role that Meteorologists have played in forming local/regional/international climate policies (e.g. Paris Agreement). **Target for Success:** Class average on each of the assignment questions	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met 16 students participated in the activity Averages of 5 questions: Question 1: (100%) Question 2: (91%) Question 3: (100%) Question 4: (72%) Question 5: (100%)	**Enhancement:** The department plans to introduce a more thorough unit in the course that covers the role of science in developing local, regional, and international climate policies and to expand the group activity into a more involved project. (03/20/2018)

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
	greater than 70% (7/10)	Average: 92% (03/20/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Target Met. However, only 16 students participated in the activity, which was entirely in-class (absent students were unable to participate). As a result, the department feels that there could be great variation from class to class with regards to the success rate. While enhancements will be suggested below, the department plans on re-assessing this SLO in next quarter's face-to-face Meteorology course in order to feel more confident with the results.	
		Program Review Reporting Year: 2017-2018 **Target :** Target Met 41 Students participated in the assessment with an average of 90% (9/10) (03/16/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** The access to online resources has allowed many of our students gain a better understanding of Global Climate Change policy. Using these resources will be helpful in further enhancing this assessment and coverage of this outcome.	**Enhancement:** Expand this assignment into a course project that will allow students more time to explore climate change policy. (05/02/2018)
	Exam - Course Test/Quiz - Mid-term Exam Question – "For maximum winter warmth, in the Northern Hemisphere, large windows in a house should face? **Target for Success:** 80% of students will answer this question correctly.	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met 94% of students answered this question correctly. (02/12/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** Target Met.	**Enhancement:** Enhancements will include additional examples of what latitudes receive the most intense solar radiation. (05/02/2018)
	Exam - Course Test/Quiz - Final Exam Question – "Which country is the world leader in Carbon Dioxide emissions?" **Target for Success:** 80% of students will answer this question correctly	**Program Review Reporting Year:** 2017-2018 **Target :** Target Met 100% of students answered this question correctly. (03/26/2018) **Reflection (CLICK ON ? FOR INSTRUCTIONS):** In this assessment, it was clear that our students were well aware of our role as a carbon dioxide emitter. However, seeing as there was a 100% success rate, the department plans to use different assessment questions in the future in order to identify and "patch up" other unapparent weaknesses in this outcome.	**Enhancement:** Since this assessment had 100% success, the department plans on identifying other areas through assessment that need enhancement. (05/02/2018)

MET 10L:Meteorology Laboratory

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MET10L_SLO_1 - Assess and defend the analysis and decision-making skills employed by meteorologists to diagnose air patterns, understand air motions and predict future atmospheric conditions. **SLO Status:** Active_Pending_Revision			

MET 20L:Climate Studies Laboratory

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
MET20L_SLO_1 - To identify the primary reasons for studying Earth's climate system and how it functions and to become more aware of the significance of climate, climate variability and climate change for our well being wherever we live. **SLO Status:** Course Not Currently Taught **Outcome Creation Date:** 09/12/2013			

Assessment: Course/Service Four Column

Dept - (PSME) Engineering

ENGR 10:Introduction to Engineering

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
ENGR10_SLO_1 - The student will be able to analyze, graph and develop a formula for a given data set. **SLO Status:** Active			
ENGR10_SLO_2 - The student will be able to write technical documentation both written and orally. **SLO Status:** Active			
ENGR10_SLO_3 - The student will work collaboratively on an engineering team. **SLO Status:** Active			

ENGR 35:Statics

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
ENGR35_SLO_1 - The student will be able to analyze two- and three-dimensional force systems on rigid bodies in static equilibrium using vector and scalar analysis methods. **SLO Status:** Active			

ENGR 37:Introduction to Circuit Analysis

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
ENGR37_SLO_1 - The student will be able to analyze circuits containing resistive, capacitive, inductive passive elements, along with op-amps interconnected to voltage and current sources. **SLO Status:** Active			
ENGR37_SLO_2 - The student will be able to use circuit laws and network theorems to solve DC steady state circuits, RC, RL, and RLC DC circuit transients and sinusoidal AC steady state circuits. **SLO Status:** Active			

ENGR 77 (X-Y):Special Projects in Engineering

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
ENGR77_SLO_1 - Investigate an area of special interest and demonstrate an appropriate level of understanding and expertise. **SLO Status:** Active **Outcome Creation Date:** 02/11/2018			

ENGR 78 X-Z:Special Projects in Electrical Engineering

Student Learning Outcomes (SLOs)	*Assessment Methods*	*Assessment Data Summaries*	*Enhancements*
ENGR78X-Z_SLO_1 - Investigate an area of special interest in the fields of Electrical Engineering and demonstrate an appropriate level of understanding and expertise. **SLO Status:** Special Projects **Outcome Creation Date:** 08/24/2015			

ENGR 79 X-Z:Special Projects in Mechanical Engineering

Student Learning Outcomes (SLOs)	Assessment Methods	Assessment Data Summaries	Enhancements
ENGR79X-Z_SLO_1 - Investigate an area of special interest and demonstrate an appropriate level of understanding and expertise. **SLO Status:** Special Projects **Outcome Creation Date:** 08/24/2015			