

# Problem Solving

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## Institutional Learning Outcome Assessment

Los Angeles Mission College

Office of Institutional Effectiveness and Learning Outcomes Assessment Committee



October 2017

[www.lamission.edu/slo](http://www.lamission.edu/slo)

## Introduction

Los Angeles Mission College (LAMC) conducted an assessment of the Problem Solving Institutional Learning Outcome (ILO) during the 2016-17 academic year. This report presents the results of that assessment.

The ILO states: *Students will demonstrate the ability to solve problems by examining, selecting, using and evaluating various approaches to developing solutions. Evidence will be the ability to observe and draw reasonable inferences from observations, distinguish between relevant and irrelevant data, define problems, analyze the structure of discipline or profession-based problem solving frameworks and to use such frameworks and strategies to develop solutions.*

The benchmark for this ILO is: *70% of the students will achieve an acceptable score or better.*

Fall 2016 class sections for courses that are designated as supporting this ILO were asked to participate in the assessment. Advanced sections were given preference over introductory courses because students enrolled in higher level classes are likely to have been enrolled at the institution longer and/or be closer to completion of their programs, so assessing these students is a better indicator of whether the institution as a whole is successfully achieving this institutional learning outcome. A total of 25 class sections from 13 different courses participated in the assessment, with a total of 418 assessed students (see Appendix 1 for a breakdown by course).

Students in each class section were given an assignment relating to the ILO (see Appendix 2 for specific evaluation methods). The assignments were rated according to a common rubric developed by a sub-committee of the Learning Outcomes Assessment Committee (LOAC). The rubric included the following four criteria:

- **Defining the Problem** (student states the problem clearly and identifies underlying issues),
- **Developing a Plan to Solve the Problem** (student develops a clear and concise plan to solve the problem, with alternative strategies, and follows the plan to the conclusion),
- **Collecting and Analyzing Information** (student collects information from multiple sources and analyzes the information in-depth), and
- **Interpreting Findings and Solving the Problem** (student provides a logical interpretation of the findings and clearly solves the problem, offering alternative solutions).

Each of the above criteria was scored on a scale of 1 to 5 as follows: Excellent (5 pts.), Good (4 pts.), Acceptable (3 pts.), Below Average (2 pts.), Unacceptable (1 pt.), with the lowest acceptable score being 3 (see Appendix 3 for a copy of the rubric).

Among the 418 students assessed, 359 (86 percent) received acceptable or above scores on the assessment. Thus, the benchmark of 70 percent of assessed students scoring acceptable or above on the ILO assessment was achieved.

Number of Students Assessed	Acceptable or Above	% Acceptable or Above	Benchmark Achieved
418	359	85.9%	<input checked="" type="checkbox"/>

## Disaggregated Assessment Results

The percentage of students achieving "acceptable or above" is disaggregated by gender, ethnicity, age, and units successfully completed at Mission below. Due to the specific demographic breakdown of our student body, some disaggregated subcategories have fewer than 30 students (grayed out). Data for these subcategories is not considered statistically reliable and should not be used as a basis for decision-making. Due to rounding, percentages may not total 100.0%.

	Number of Students Assessed	Acceptable or Above	% Acceptable or Above	Percentage Point Gap
<b>Total</b>	<b>418</b>	<b>359</b>	<b>85.9%</b>	<b>N/A</b>
<b>Gender</b>				
Female	247	223	90.3%	4.4
Male	171	136	79.5%	-6.4
<b>Ethnicity</b>				
Hispanic	323	277	85.8%	-0.1
White	37	32	86.5%	0.6
Asian	30	24	80.0%	-5.9
Black	6	6	100.0%	14.1
Native American	2	2	100.0%	14.1
Pacific Islander	2	2	100.0%	14.1
Other/Unknown	18	16	88.9%	3.0
<b>Age</b>				
Under 18	2	2	100.0%	14.1
18-21	137	117	85.4%	-0.5
22-25	147	120	81.6%	-4.3
26-30	56	49	87.5%	1.6
31-40	33	28	84.8%	-1.0
Over 40	43	43	100.0%	14.1
<b>Units Successfully Completed at LAMC</b>				
0 units	47	44	93.6%	N/A
1 to 15 units	47	38	80.9%	N/A
16 to 30 units	77	71	92.2%	N/A
31 to 45 units	79	66	83.5%	N/A
46 to 60 units	74	61	82.4%	N/A
Over 60 units	94	79	84.0%	N/A

The high percentage of students who achieved an acceptable or above score indicates that the College is successfully teaching students the skills needed to achieve this institutional learning outcome. However, results are not consistent across all demographic groups. For example, a much higher proportion of women than men achieved acceptable or above scores on the assessment, with 90 percent of women as compared with 80 percent of men achieving acceptable or above. According to the percentage point gap

methodology<sup>1</sup> of measuring disproportionate impact, there is an equity gap for male students with regard to this ILO. Furthermore, while Hispanic and White students performed equally well, Asian students performed less well, and are also experiencing disproportionate impact. There were too few students of other race/ethnicity categories for analysis.

With regard to age, there is an equity gap for the 22-25 age group, which was the lowest performing age group. There were too few students under 18 for comparative analysis.

Despite evidence of disproportionate impact for male students and Asian students, all demographic groups in the assessment sample met the 70% benchmark.

All age groups met the 70% benchmark for this ILO assessment. There does not seem to be a correlation between age and success on the assessment. Similarly, all groups regardless of the number of units successfully completed at Mission met the 70% benchmark. As expected, the 1-15 unit group had the lowest performance level. Somewhat aberrantly, the zero unit group (those who had not completed any units at Mission prior to the term of the assessment), showed the highest performance. This may be due to the fact that some of these students may have completed the majority of the education at another campus, and are simply completing their final course(s) at Mission prior to graduation.

## Normalized Scores

Normalized scores are a way to compare scores across rubrics with different rating scales. For example, some rubrics may have only three categories, while other rubrics may have four or more categories. Using normalized scores allows us to compare scores across these different rubrics using a standard scale that ranges from 1.00 to -1.00. In this scale, a positive number indicates "acceptable or above" and a negative number indicates below acceptable. While any number between 0.01 and 0.99 indicates "acceptable or above," larger numbers indicate higher scores. Similarly, all negative decimals indicate a score below acceptable, but larger negative numbers indicate a "worse" score.

The table below shows the average normalized score disaggregated by gender, ethnicity, age and units successfully completed at LAMC. As with the tables above, some disaggregated subcategories have fewer than 30 students and have been grayed out in the table. Data for these subcategories is not statistically reliable and should not be used as a basis for decision-making. Due to rounding, percentages may not total 100.0%.

	<b>Number of Students Assessed</b>	<b>Average Normalized Score</b>
<b>Total</b>	<b>418</b>	<b>0.51</b>
<b>Gender</b>		
Female	247	0.56
Male	171	0.42
<b>Ethnicity</b>		
Hispanic	323	0.49
White	37	0.58
Asian	30	0.50

<sup>1</sup> A percentage point gap of -3 or more is indicative of disproportionate impact. The percentage point gap is calculated by subtracting the rate (%) of the subgroup from the College average rate (%). A negative sign indicates that the subgroup has a lower success rate than the College average.

Black	6	0.75
Native American	2	0.69
Pacific Islander	2	1.00
Other/Unknown	18	0.49
<b>Age</b>		
Under 18	2	0.81
18-21	137	0.47
22-25	147	0.43
26-30	56	0.55
31-40	33	0.57
Over 40	43	0.74
<b>Units Successfully Completed at LAMC</b>		
0 units	47	0.62
1 to 15 units	47	0.43
16 to 30 units	77	0.64
31 to 45 units	79	0.43
46 to 60 units	74	0.44
Over 60 units	94	0.49

The average normalized score across all students assessed was 0.51. This indicates that the majority of students assessed achieved an acceptable score and a fair number received "excellent" ratings. As above, women had a higher average normalized score than men (0.56 compared to 0.42, respectively), indicating that more women achieved higher scores than men. With regard to race/ethnicity, White students scored higher than Hispanic and Asian students. There were too few students in the other race/ethnicity categories for valid comparison.

As above, there does not seem to be a correlation between average normalized score and either age or units successfully completed at Mission.

## Assessment Results by Discipline and Course

The tables below show the assessment results disaggregated by discipline and course (Appendix 1 lists the number of students assessed in each course and discipline). Discipline totals are included below only when more than one course from that discipline participated in the assessment. As with the tables above, data for categories with small number of students are not statistically reliable and should not be used as a basis for decision-making. Due to rounding, percentages may not total 100.0%.

	Number of Students Assessed	Acceptable or Above	% Acceptable or Above	Average Normalized Score
<b>Accounting</b>				
ACCTG 002: Introductory Accounting II	18	14	77.8%	0.46
<b>Administration of Justice</b>				
ADM JUS 005: Criminal Investigation	28	27	96.4%	0.79

<b>Art</b>				
ART 502: Beginning 3D Design	13	13	100.0%	0.60
<b>Biology</b>				
BIOLOGY 006: Molecular & Cell Biology	26	10	38.5%	0.03
<b>Child Development</b>				
CH DEV 045: Programs for Children with Special Needs	63	58	92.1%	0.71
<b>Culinary Arts</b>				
CLN ART 106: Purchasing & Receiving	43	40	93.0%	0.59
<b>Mathematics</b>	<b>131</b>	<b>113</b>	<b>86.3%</b>	<b>0.51</b>
MATH 125: Intermediate Algebra	44	42	95.5%	0.68
MATH 227: Statistics	52	41	78.8%	0.32
MATH 266: Calculus with Analytic Geometry II	35	30	85.7%	0.58
<b>Philosophy</b>				
PHILOS 006: Logic in Practice	24	23	95.8%	0.28
<b>Physics</b>				
PHYSICS 037: Physics for Engineers & Scientists I	26	15	57.7%	0.24
<b>Sociology</b>	<b>46</b>	<b>46</b>	<b>100.0%</b>	<b>0.50</b>
SOC 004: Sociological Analysis	29	29	100.0%	0.40
SOC 024: Social Psychology	17	17	100.0%	0.68
<b>TOTAL</b>	<b>418</b>	<b>359</b>	<b>85.9%</b>	<b>0.51</b>

Students achieved varying levels of success on the assessment based on the course and discipline they were enrolled in. The percentage of acceptable or above scores ranged from 100% for Art and Sociology to 38.5% for Biology. In addition to Biology, the Physics discipline also did not meet the 70% benchmark for this ILO with a 57.7% acceptable or above rate. These two courses likely had the most difficult assessments and the lower achievement levels may reflect this. Administration of Justice had the highest average normalized score (0.79) with 96.4% of students assessed scoring acceptable or above. Child Development, Culinary Arts and Philosophy also had over 90% of students assessed achieve acceptable or above ratings.

Students enrolled in Math courses accounted for almost one-third (31.3%) of the students assessed. The next most represented discipline was Child Development, accounting for 15.1% of assessed students. These two disciplines accounted for almost half (46.4%) of all students assessed. Thus, the performance of students in these courses strongly affects the overall results of the assessment.

Three math courses participated in the assessment: Math 125 (Intermediate Algebra), Math 227 (Statistics) and Math 266 (Calculus with Analytic Geometry II). The three courses represent three distinct levels of math placement, ranging from pre-college math (Algebra) to college-level math for STEM non-majors (Statistics) to college math for STEM majors (Calculus II). Levels of achievement differed for each course/level, with Intermediate Algebra scoring the highest and Statistics scoring the lowest on both percentage of students scoring acceptable or above and average normalized score.

## Analysis by the Instructors

The instructors for all of the sections assessed described their students as doing well on the assignment and for the most part meeting the benchmark. Analyses by course are summarized below.

ACCTG 002	In general, students scored well in defining the problem and developing an approach to solving the problem. The problem assigned was relatively difficult and required gathering and analyzing appropriate data which, for some students, was challenging. The actual problem solving and interpretation is an area which needs improvement.
ACCTG 002	Generally, students scored well in defining the problem and developing an approach to solve the problem. Because of the length of the problem, many different pieces of data were required and a number of calculations were necessary. Finally, students were required to interpret and support their answer. Given the difficulty, the scores were very favorable.
ACCTG 002	Overall, student scores were improved relative to prior assessment. This area, cost accounting, is different than financial accounting and is more difficult. Progress is good using instructor t-account (instead of textbook) methodology which seems to replicate movement of costs through accounts more effectively for students.
ADM JUS 005	The students did well in each criterion of the rubric most scoring in the excellent or good rating. A majority of students were active participants in lecture and had exemplary attendance records. Many students expressed that the reason they took this course was for this capstone exercise and they took the assignment very seriously. A few students missed important lectures and assignments that were needed to complete all aspects of the capstone project that this student learning outcomes was assessed from. The students had an average of 91% on this Student Learning Outcome well above the benchmark of 70%.
ADM JUS 005	A majority of students did well in the assessment and were active participants in lecture and had exemplary attendance records. A few students had sporadic attendance and missed important lectures where student learning outcomes were covered. 86% of students meet the outcome surpassing the benchmark.
ART 502	All students met the benchmark. Students did best with defining the problem 4.4 out of 5 or 88%, this means that all were able to come up with a proposal and prepare the needed materials appropriately. Students score lowest on Solving the Problem at 3.8 or 75%, the critique here is the quality of the work. Some pieces were disproportionate and some lacked a finished quality with painting or issues with the plaster. The class had a substitute for two weeks of this project and the substitute may have not been able to correct students before they made the errors.
BIOLOGY 006	The average student performance for each criterion is very close to "acceptable" with the exception of collecting and analyzing relevant information which was significantly above "acceptable". This criterion is the least relevant since no data collection was required, all data was provided in the problem. On the problem as a whole, only 38% of the students solved the problem in an "acceptable" manner. While this is a very challenging "exit level" problem, the benchmark of at least 70% of students performing at an acceptable level is far from being met. While the average scores for the class are very close to acceptable, it is the 38% of students who understood how to approach and solve the problem that pulled the average up to an "acceptable" level. Students were provided with practice problems of this type, both with and without answers, however it is not known how many students actually put effort into these problems.
CH DEV 045	Defining the problem: All of the students were able to identify & define one area of strength in the classroom they observed and were able to define one area for improvement related to educational strategies (best practices) used in the classroom being observed.

	<p>Developing a plan: All students were able to develop one specific educational strategy to improve services/education delivered to the children with special needs being observed.</p> <p>Collecting &amp; Analyzing relevant information: All of the students were able to observe and record the overall strengths and developmental needs of the children observed in the special education classroom.</p> <p>Solving the problem: All of the students were able to find at least one practical solution to address one specific need of the program and the developmental needs of children being observed.</p> <p>The benchmark was achieved. Students had an average score of 87%. Some students were not able to find specific needs of children with special needs because they observed inclusive classrooms with just a few children with high incidence disabilities. Assignment required the students to observe a low incident disabilities classroom and not a high incidence classroom.</p>
CH DEV 045	<p>Overall, students provided well collected data and observations. They provided details regarding what they observed and included accommodations and suggestions regarding environment and activities from program. They utilized their previous learning on developmental domains as they assessed child's developmental challenges and needs. The benchmark was achieved as overall the average score was in the 90%.</p>
CLN ART 106	<p>Overall, the benchmark was achieved in each criterion. I spent a lot of time in class on the particular subject of receiving and handling fresh fish in a foodservice operation. Knowing that I was going to test the students on their problem solving capabilities, I did focus quite a bit on honing the student's mastery of the ins and outs of receiving fresh fish. I believe that the strong outcome that the students showed in the exam was a product of the amount of preparation time in class that we devoted to the subject matter.</p> <p>Defining the problem: The Culinary 106 students demonstrated that they had a good solid understanding of the problem presented, as well as the underlying challenges that are inherent in the purchasing and receiving of fresh fish. They had a background of understanding from the 050 Sanitation and Safety class, where they were first introduced the problem of maintaining strict sanitation principles when ordering and receiving fresh seafood.</p> <p>Developing a plan to solve the problem: The students showed the ability to develop a plan to make the purchasing and handling of fresh fish in a foodservice environment safe and sensible. Most of the students developed a coherent plan to improve the food safety in the case study that they were given.</p> <p>Collecting &amp; analyzing relevant information: Many of the 106 students listed approved and reputable sources for collecting information regarding to the safe handling of fresh fish. They were able to collect relevant information and apply an adequate plan to correct the mistakes that were presented in the exam.</p>
MATH 125	<p>For part I, 86% (38/44) of the students earned at least 3 out of 5 points. For part II, 98% (43/44) of students earned at least 3 out of 5 points. For part III, 98% (43/44) of the students earned at least 3 out of 5 points. For part IV, 89% (39/44) of the students earned at least 3 out of 5 points. Overall, the results exceeded the expected benchmark of the math department: 60% of the students achieve an acceptable score of 3 or better on a scale of 0 to 5.</p>
MATH 227	<p>For part I, 96% (50/52) of the students earned at least 3 out of 5 points. For part II, 71% (37/52) of students earned at least 3 out of 5 points. For part III, 81% (42/52) of the students earned at least 3 out of 5 points. For part IV, 69% (36/52) of the students earned at least 3 out of 5 points. Overall, the results exceeded the expected benchmark of the math department: 60% of the students achieve an acceptable score of 3 or better on a scale of 0 to 5.</p>
MATH 266	<p>For part I, 80% (28/35) of the students earned at least 3 out of 5 points. For part II, 91% (32/35) of students earned at least 3 out of 5 points. For part III, 91% (32/35) of the students earned at least 3 out of 5 points. For part IV, 86% (30/35) of the students</p>



	earned at least 3 out of 5 points. Overall, the results exceeded the expected benchmark of the math department: 60% of the students achieve an acceptable score of 3 or better on a scale of 0 to 5.
PHILOS 006	In this assessment students were ask to defend a position on the topic of abortion or gay marriage. If they developed an argument to support their position, that gave them an acceptable score. If the argument was strong, and opposing concerns were adequately addressed, they got a good or excellent rating. Most students were able of develop an argument to support their position; and many produced strong arguments. Criteria three was hard to meet since no data was gathered, they already had to know what the arguments for and against were (some were included in the prompt).
PHILOS 006	Just below the benchmark but most student were able to use one of the two formal techniques for determining the validity of a deductive argument.
PHYSICS 037	Criteria 1 and 2 were in the 70's, while criterion 3 was 66% and criterion 4 was 59%. Strength: students were able to see where the forces were applied in the problem. Challenge: students had a hard time transferring a force into a torque by identifying the moment arm. Benchmark was achieved for average score.
SOC 004	The students were very clear on defining the problems that they were analyzing and using specific research methods to solve the problem. Their challenges were in analyzing the data or even deciding what data to look at for their analysis. Most discussed that the problem could be solved, but didn't know by whom or how to go about it. The benchmark was surpassed at 76%. This assignment may have been done too early in the semester.
SOC 024	The students did a great job with this assessment by surpassing the benchmark with 87%. Their strengths were in following the instructions and addressing each issue thoroughly. The challenge for some students was to place themselves in the scenarios and stay focused on the research concepts discussed in their textbook. But this only happened with a few students.
SOC 024	Students did a great job describing their families' views of conforming and identifying media impact and their body image. Students were challenged in identifying the impact on men and women. This is a common issue depending on the age of the student and their life experiences. Overall, the students surpassed the benchmark with 88%, well over the benchmark.

## Assessment Results by Rubric Criteria

In order to gain a more nuanced understanding of which aspects of the ILO students are excelling at and which ones they are underperforming in, rubric scores were analyzed by criteria. The four criteria included in the Problem Solving Rubric were 1) Defining the Problem, 2) Developing a Plan to Solve the Problem, 3) Collecting and Analyzing Relevant Information, 4) Solving the Problem (see Appendix 3 for a copy of the full rubric).

While the 70 percent benchmark was met for all four criteria, students achieved the highest scores on the Defining the Problem, and the lowest scores on Solving the Problem. Detailed breakdowns for each criteria and demographic group are given in Appendices 4-7.

Criteria	Number of Students Assessed	Acceptable or Above	% Acceptable or Above	Average Rubric Score (out of 5.0)
1) Defining the Problem	418	376	90.0%	4.1
2) Developing a Plan	418	366	87.6%	4.0
3) Collecting Information	418	371	88.8%	4.0
4) Solving the Problem	418	346	82.8%	3.8

## Comparison of Assessed Students to Overall Student Body

The table below compares the proportion of students in each disaggregated demographic subgroup with their percentages in the overall college student body. The sample of students assessed reflects the student body at the College fairly well. While more female students were assessed, their proportion in the student body is still slightly higher than their proportion among the sample assessed. The same holds for Hispanic students and White students, with a slightly higher proportion of Asian students making up the difference in the assessed sample. For age, there were very few students under 18 in the sample as compared with the student body. This is due to the nature of the assessment which was to gauge achievement levels of students who are close to completing their programs, thus the students assessed are likely to be older, as shown by the high percentage of students in the 22-25 age group.

	<b>Number of Students Assessed</b>	<b>% of Students Assessed</b>	<b>% of Fall 2016 Student Body</b>
<b>Total</b>	<b>418</b>	<b>100.0%</b>	<b>100.0%</b>
<b>Gender</b>			
Female	247	59.1%	61.2%
Male	171	40.9%	38.8%
<b>Ethnicity</b>			
Hispanic	323	77.3%	79.3%
White	37	8.9%	10.4%
Asian	30	7.2%	4.3%
Black	6	1.4%	2.6%
Native American	2	0.5%	0.1%
Pacific Islander	2	0.5%	0.1%
Other/Unknown	18	4.3%	1.7%
<b>Age</b>			
Under 18	2	0.5%	10.8%
18-21	137	32.8%	35.2%
22-25	147	35.2%	20.7%
26-30	56	13.4%	11.8%
31-40	33	7.9%	10.2%
Over 40	43	10.3%	6.4%

## Conclusion and Future Steps

The 70 percent benchmark for this Institutional Learning Outcome (ILO) was achieved and Los Angeles Mission College is fulfilling its commitment to teach students to solve problems by examining, selecting, using and evaluating various approaches to developing solutions.

The Problem Solving Institutional Learning Outcome (ILO) report was discussed during LOAC meetings and at the College's annual SLO Summit on Friday, October 20, 2017.

Despite some equity gaps, all demographic groups met the benchmark for this assessment. However, the College was concerned that no correlation was seen between taking more units at Mission and better performance on the assessment. This may be due to students with more units taking higher level classes which have more difficult assessments. It was suggested that pre- and post- testing might give a better indication of whether enrollment at the College was responsible for students learning the skills being assessed, rather than the College taking credit for teaching skills that students came in with.

It was mentioned that some of the disaggregated categories are too small for useful comparison and that conversely, the categories are not specific enough to identify how we can help the lowest achieving students. The small number of students participating in some disciplines was also mentioned not being large enough to be statistically significant. Participation of more faculty will be encouraged as the number of students assessed depends on the full participation of faculty teaching the courses attached to the ILO.

Suggestions for improvement by the instructors included emphasizing the developing solutions aspect of the ILO. In addition, it is recommended that the College encourage faculty to integrate problem solving into more courses in different disciplines, especially when updating or writing new courses.

While not all disciplines were represented in this assessment, the disciplines included are limited to those with courses that support the Problem Solving ILO. Thus, it is not feasible to include a broader range of disciplines. Future assessments will make an effort to consider comparative course enrollment levels within the assessment design. For example, if the majority of students at the College are learning about problem solving in their Math courses, then more Math sections should be included in the sample.

As a result of this assessment, the College as a whole engaged in a number of animated discussions about whether different assessments conducted in different classes but rated on a common rubric are comparable to each other, and how differences in normalized scores across disciplines should be interpreted. While different courses may show the same average score, the distribution of scores may be vastly different.

Cross-disciplinary norming sessions for working with the common rubric were suggested as a way to standardize what is considered "acceptable." A universal exit assessment administered upon petition for graduation was suggested to assess graduates' skill levels rather than attempting to extrapolate based on samples of students enrolled in capstone courses.

It was remarked that the common rubric used for this ILO may have had an empirical science bias as one of the criteria specifically mentioned included collecting and analyzing information, which is not used in all problem solving contexts. In the future, it was suggested that different rubrics could be used for different disciplines and normalized scores could be used to compare data across different rubrics, or disciplines could add additional criteria to a more pared down version of a common rubric.

While a standardized assessment, as was conducted for the Written Communication and Ethics & Values ILOs, would avoid certain methodological pitfalls mentioned above, it was also recognized that each discipline and program requires different kinds of problem solving skills, ranging from solving math problems to deciding whether a raw fish is fit for human consumption. And, a universal assessment might have to be too broad to truly assess whether the graduating students have achieved the skills necessary to succeed in the chosen discipline. A mixed approach, such as was conducted for Information Competency, where individual courses completed their own assessments but all students were given a questionnaire to complete in addition, may be a possible compromise.

The main conclusion reached during the College's discussions of this ILO assessment was the need to revise the ILO itself. Currently, the wording of the ILO is seen as having an empirical science bias, which makes assessment in problem solving for humanistic disciplines difficult. For example, Philosophy uses problem solving, but does not draw inferences from observations. It was also mentioned that the word "data" is often interpreted as referring solely to numerical data, and could be replaced by a broader term, such as "information" or "facts". It was also suggested that the ILO be split into two separate ILOs for critical thinking and scientific reasoning. Thus, the Learning Outcomes Assessment Committee will be undertaking the task of revising the ILO during the 2017-18 academic year.

## Appendix 1: Courses Participating in the Assessment

Note: Discipline totals are included below only when more than one course from that discipline participated in the assessment (i.e., Math and Sociology).

Course	Number of Sections	Assessed Students*	% of Students Assessed
<b>Accounting</b>			
ACCTG 002: Introductory Accounting II	2	18	4.3%
<b>Administration of Justice</b>			
ADM JUS 005: Criminal Investigation	1	28	6.7%
<b>Art</b>			
ART 502: Beginning 3D Design	1	13	3.1%
<b>Biology</b>			
BIOLOGY 006: Molecular & Cell Biology	1	26	6.2%
<b>Child Development</b>			
CH DEV 045: Programs for Children with Special Needs	2	63	15.1%
<b>Culinary Arts</b>			
CLN ART 106: Purchasing & Receiving	1	43	10.3%
<b>Mathematics</b>	<b>6</b>	<b>131</b>	<b>31.3%</b>
MATH 125: Intermediate Algebra	2	44	10.5%
MATH 227: Statistics	2	52	12.4%
MATH 266: Calculus w/Analytic Geometry II	2	35	8.4%
<b>Philosophy</b>			
PHILOS 006: Logic in Practice	1	24	5.7%
<b>Physics</b>			
PHYSICS 037: Physics for Engineers & Scientists I	1	26	6.2%
<b>Sociology</b>	<b>2</b>	<b>46</b>	<b>11.0%</b>
SOC 004: Sociological Analysis	1	29	6.9%
SOC 024: Social Psychology	1	17	4.1%
<b>TOTAL</b>	<b>18</b>	<b>418</b>	<b>100.0%</b>

\* Students who were absent on the day of the assessment or who dropped the course prior to the assessment were not assessed.

## Appendix 2: Assessment Method by Course

<b>ACCTG 002: Introductory Accounting II</b>
Computational Exam Problem - Capital Investment Analysis
<b>ADM JUS 005: Criminal Investigation</b>
Students completed a capstone project utilizing skills learned throughout the semester to "Analyze a basic crime scene and evaluate the types of evidence to be collected and preserved"; The students were given two non-cumulative exams during the semester (Midterm and Final examination) each exam consisted of fifty questions and five questions from each exam were identified as assessment questions to determine if the student learning outcomes had been met.
<b>ART 502: Beginning 3D Design</b>
Students are given 4 weeks to complete a POP art sculpture. They need to select a topic, find and purchase materials, form the chicken wire into the sculpture, cover with plaster and cheese cloth and paint. The topic is POP art, which can be solved by making a comment on contemporary society through the sculpture form.
<b>BIOLOGY 006: Molecular &amp; Cell Biology</b>
Students are to solve a genetics problem that incorporates the most challenging aspects of genetics learned in this course. Specifically, they are to use information provided about two linked genes to determine the probabilities of all possible phenotypes in the offspring of two hypothetical fruit flies. To do so they must identify a) which alleles of the two genes are linked b) which allelic combinations in gametes are recombinant c) the proportion of gametes which are recombinant or non-recombinant for each parent fly, and d) the probabilities of all possible phenotypes (involving two characters) for their offspring based on Punnett square analysis.
<b>CH DEV 045: Programs for Children with Special Needs</b>
Midterm Assignment. Students will visit a public school and will conduct an observation of a preschool to second grade special education classroom. Students will answer 10 questions and will list and explain observed accommodation practices, inclusive practices, best practices and developmental needs of children. Based on the observation, students will identify areas of improvement in relation to instruction and service delivery (speech, occupational therapy, etc.); Students observe a child with disabilities for a minimum of one hour to collect data on relevant information regarding the disability, accommodations to environment, and how the environment is conducive to child's needs and strengths. For this assignment, students can visit a preschool, kindergarten or daycare program and observe a child ages 3 to 5 with an identified/diagnosed special need. Once data is collected, student is to write a report paper with a minimum of 3 pages describing observations and the positive and negative regarding the environment or activities where the child was observed. this report includes: a) name of program b) children's age c) time and date of observation d) amount of children and adults in the classroom you observed e) any adaptation observed in the setting or in the activities f) what the daily routine looks like including description of activities.
<b>CLN ART 106: Purchasing &amp; Receiving</b>
In 106 purchasing and receiving class, we discussed the proper receiving of fresh fish. The text book has a section on receiving fresh fish, we talked about it in class, and I gave my students multiple handouts regarding the proper handling and receiving of fresh fish. I assigned a research project on the subject as well and asked the students to share their findings in class. I gave my class two practice tests on how well they understood the concepts of safe and appropriate receiving of fresh fish, and let them know that they would be taking an exam on the subject near the end of the term. I introduced the concepts early in the class and reviewed the information that my students all had learned in 050 Sanitation and Safety class, a foundation class that all of them have taken previously that also focused on the receiving and handling of fresh fish in a foodservice operation.
<b>MATH 125: Intermediate Algebra</b>
Two sections of Math 125 (Intermediate Algebra) were required to answer questions for assessing ILO toward the end of the Fall 2016 semester.

<b>MATH 227: Statistics</b>
Two sections of Math 227 (Elementary Statistics) were required to answer questions for assessing ILO toward the end of the Fall 2016 semester.
<b>MATH 266: Calculus with Analytic Geometry II</b>
Two sections of Math 266 (Calculus with Analytic Geometry II) were required to answer the questions for assessing ILO on the final exam.
<b>PHILOS 006: Logic in Practice</b>
In class argumentative essay; Students determine the validity or invalidity of an argument using a formal technique (Venn Diagram or Truth-table)
<b>PHYSICS 037: Physics for Engineers &amp; Scientists I</b>
Problem in a brief pre-lecture quiz with measurement based on performance
<b>SOC 004: Sociological Analysis</b>
Students were assigned a program evaluation research method on whether LAMC was meeting its mission in specific areas. This occurred in week 4 of the semester, after lecture on program evaluation methods. A two-page analysis was assigned including a portion on solutions.
<b>SOC 024: Social Psychology</b>
Students viewed a video on Advertisement and Body image and analyzed in an essay their own social expectation on body image, social pressure to conform from their own family, cultural messages, and/or the impact of media exposure over time.

### Appendix 3: Problem Solving Rubric

Criteria	Excellent (5 pts.)	Good (4 pts.)	Acceptable (3 pts.)	Below Average (2 pts.)	Unacceptable (1 pts.)
<b>1. Defining the Problem</b>	Demonstrates exceptional understanding of the problem and underlying challenges.	Demonstrates clear understanding of the problem and underlying challenges.	Demonstrates adequate understanding of the problem.	Does not demonstrate adequate understanding of the problem.	Does not identify or understand the problem.
<b>2. Developing a Plan to Solve the Problem</b>	Develops a superior plan to solve the problem.	Develops a clear and concise plan to solve the problem.	Develops an adequate plan to solve the problem.	Develops a marginal plan to solve the problem.	Does not develop a coherent plan to solve the problem.
<b>3. Collecting and Analyzing Relevant Information</b>	Collects relevant information from multiple sources and analyzes the information in depth.	Collects relevant information from multiple sources and carefully analyzes the information.	Collects adequate information and performs basic analyses.	Collects inadequate information to perform meaningful analyses.	Does not collect relevant information.
<b>4. Solving the Problem</b>	Achieves an excellent solution to the problem with no reservations or shortcomings.	Achieves a quality solution with minor reservations or shortcomings.	Achieves an adequate solution to the problem.	Does not achieve an adequate solution to the problem.	Does not achieve a relevant solution to the problem.

## Appendix 4: Assessment Results by Rubric Criteria: Criteria #1: Defining the Problem

Note: Discipline totals are included below only when more than one course from that discipline participated in the assessment.

	Number Assessed	Acceptable or Above	% Acceptable or Above	Average Rubric Score (out of 5.0)
<b>Total</b>	<b>418</b>	<b>376</b>	<b>90.0%</b>	<b>4.1</b>
<b>Gender</b>				
Female	247	230	93.1%	4.3
Male	171	146	85.4%	3.9
<b>Ethnicity</b>				
Hispanic	323	290	89.8%	4.1
White	37	34	91.9%	4.4
Asian	30	26	86.7%	4.2
Black	6	6	100.0%	4.7
Native American	2	2	100.0%	5.0
Pacific Islander	2	2	100.0%	5.0
Other/Unknown	18	16	88.9%	4.1
<b>Age</b>				
Under 18	2	2	100.0%	5.0
18-21	137	125	91.2%	4.1
22-25	147	125	85.0%	4.0
26-30	56	52	92.9%	4.3
31-40	33	29	87.9%	4.1
Over 40	43	43	100.0%	4.5
<b>Units Successfully Completed at LAMC</b>				
0 units	47	44	93.6%	4.3
1 to 15 units	47	38	80.9%	3.7
16 to 30 units	77	73	94.8%	4.4
31 to 45 units	79	72	91.1%	4.0
46 to 60 units	74	65	87.8%	4.1
Over 60 units	94	84	89.4%	4.2



## Appendix 4: Assessment Results by Rubric Criteria (cont.)

Note: Discipline totals are included below only when more than one course from that discipline participated in the assessment.

1) Defining the Problem (cont.)	Number Assessed	Acceptable or Above	% Acceptable or Above	Average Rubric Score (out of 5.0)
<b>Discipline/Course</b>				
<b>Accounting</b>				
ACCTG 002: Introductory Accounting II	18	18	100.0%	4.6
<b>Admin. of Justice</b>				
ADM JUS 005: Criminal Investigation	28	28	100.0%	4.7
<b>Art</b>				
ART 502: Beginning 3D Design	13	13	100.0%	4.4
<b>Biology</b>				
BIOLOGY 006: Molecular & Cell Biology	26	15	57.7%	3.0
<b>Child Development</b>				
CH DEV 045: Programs for Children with Special Needs	63	58	92.1%	4.4
<b>Culinary Arts</b>				
CLN ART 106: Purchasing & Receiving	43	40	93.0%	4.2
<b>Mathematics</b>	<b>131</b>	<b>116</b>	<b>88.5%</b>	<b>4.0</b>
MATH 125: Intermediate Algebra	44	38	86.4%	3.7
MATH 227: Statistics	52	50	96.2%	4.2
MATH 266: Calculus with Analytic Geometry II	35	28	80.0%	4.1
<b>Philosophy</b>				
PHILOS 006: Logic in Practice	24	23	95.8%	3.8
<b>Physics</b>				
PHYSICS 037: Physics for Engineers & Scientists I	26	19	73.1%	4.0
<b>Sociology</b>	<b>46</b>	<b>46</b>	<b>100.0%</b>	<b>4.3</b>
SOC 004: Sociological Analysis	29	29	100.0%	4.2
SOC 024: Social Psychology	17	17	100.0%	4.4

## Appendix 5: Assessment Results by Rubric Criteria: Criteria #2: Developing a Plan to Solve the Problem

Note: Discipline totals are included below only when more than one course from that discipline participated in the assessment.

	Number Assessed	Acceptable or Above	% Acceptable or Above	Average Rubric Score (out of 5.0)
<b>Total</b>	<b>418</b>	<b>366</b>	<b>87.6%</b>	<b>4.0</b>
<b>Gender</b>				
Female	247	221	89.5%	4.1
Male	171	145	84.8%	3.9
<b>Ethnicity</b>				
Hispanic	323	282	87.3%	4.0
White	37	33	89.2%	4.2
Asian	30	25	83.3%	4.1
Black	6	6	100.0%	4.3
Native American	2	2	100.0%	5.0
Pacific Islander	2	2	100.0%	5.0
Other/Unknown	18	16	88.9%	3.9
<b>Age</b>				
Under 18	2	2	100.0%	4.5
18-21	137	119	86.9%	4.0
22-25	147	122	83.0%	3.9
26-30	56	52	92.9%	4.1
31-40	33	28	84.8%	4.1
Over 40	43	43	100.0%	4.5
<b>Units Successfully Completed at LAMC</b>				
0 units	47	44	93.6%	4.2
1 to 15 units	47	41	87.2%	4.1
16 to 30 units	77	70	90.9%	4.3
31 to 45 units	79	68	86.1%	3.9
46 to 60 units	74	61	82.4%	3.9
Over 60 units	94	82	87.2%	4.0

## Appendix 5: Assessment Results by Rubric Criteria (cont.)

Note: Discipline totals are included below only when more than one course from that discipline participated in the assessment.

<b>2) Developing a Plan to Solve the Problem (cont.)</b>	<b>Number Assessed</b>	<b>Acceptable or Above</b>	<b>% Acceptable or Above</b>	<b>Average Rubric Score (out of 5.0)</b>
<b>Discipline/Course</b>				
<b>Accounting</b>				
ACCTG 002: Introductory Accounting II	18	15	83.3%	4.2
<b>Admin. of Justice</b>				
ADM JUS 005: Criminal Investigation	28	28	100.0%	4.5
<b>Art</b>				
ART 502: Beginning 3D Design	13	13	100.0%	4.3
<b>Biology</b>				
BIOLOGY 006: Molecular & Cell Biology	26	12	46.2%	3.0
<b>Child Development</b>				
CH DEV 045: Programs for Children with Special Needs	63	58	92.1%	4.4
<b>Culinary Arts</b>				
CLN ART 106: Purchasing & Receiving	43	40	93.0%	4.1
<b>Mathematics</b>	<b>131</b>	<b>113</b>	<b>86.3%</b>	<b>4.0</b>
MATH 125: Intermediate Algebra	44	43	97.7%	4.6
MATH 227: Statistics	52	38	73.1%	3.6
MATH 266: Calculus with Analytic Geometry II	35	32	91.4%	3.7
<b>Philosophy</b>				
PHILOS 006: Logic in Practice	24	23	95.8%	3.7
<b>Physics</b>				
PHYSICS 037: Physics for Engineers & Scientists I	26	18	69.2%	3.7
<b>Sociology</b>	<b>46</b>	<b>46</b>	<b>100.0%</b>	<b>4.3</b>
SOC 004: Sociological Analysis	29	29	100.0%	4.1
SOC 024: Social Psychology	17	17	100.0%	4.5

## Appendix 6: Assessment Results by Rubric Criteria: Criteria #3: Collecting and Analyzing Relevant Information

Note: Discipline totals are included below only when more than one course from that discipline participated in the assessment.

	Number Assessed	Acceptable or Above	% Acceptable or Above	Average Rubric Score (out of 5.0)
<b>Total</b>	<b>418</b>	<b>371</b>	<b>88.8%</b>	<b>4.0</b>
<b>Gender</b>				
Female	247	226	91.5%	4.1
Male	171	145	84.8%	3.9
<b>Ethnicity</b>				
Hispanic	323	288	89.2%	4.0
White	37	33	89.2%	4.2
Asian	30	25	83.3%	4.0
Black	6	6	100.0%	4.7
Native American	2	1	50.0%	3.5
Pacific Islander	2	2	100.0%	5.0
Other/Unknown	18	16	88.9%	4.1
<b>Age</b>				
Under 18	2	2	100.0%	4.5
18-21	137	121	88.3%	4.0
22-25	147	126	85.7%	3.9
26-30	56	50	89.3%	4.1
31-40	33	30	90.9%	4.2
Over 40	43	42	97.7%	4.4
<b>Units Successfully Completed at LAMC</b>				
0 units	47	45	95.7%	4.4
1 to 15 units	47	41	87.2%	4.0
16 to 30 units	77	72	93.5%	4.3
31 to 45 units	79	68	86.1%	3.8
46 to 60 units	74	63	85.1%	3.8
Over 60 units	94	82	87.2%	4.0

## Appendix 6: Assessment Results by Rubric Criteria (cont.)

Note: Discipline totals are included below only when more than one course from that discipline participated in the assessment.

3: Collecting and Analyzing Relevant Information (cont.)	Number Assessed	Acceptable or Above	% Acceptable or Above	Average Rubric Score (out of 5.0)
<b>Discipline/Course</b>				
<b>Accounting</b>				
ACCTG 002: Introductory Accounting II	18	14	77.8%	3.8
<b>Admin. of Justice</b>				
ADM JUS 005: Criminal Investigation	28	27	96.4%	4.5
<b>Art</b>				
ART 502: Beginning 3D Design	13	13	100.0%	4.3
<b>Biology</b>				
BIOLOGY 006: Molecular & Cell Biology	26	21	80.8%	3.4
<b>Child Development</b>				
CH DEV 045: Programs for Children with Special Needs	63	58	92.1%	4.4
<b>Culinary Arts</b>				
CLN ART 106: Purchasing & Receiving	43	40	93.0%	4.2
<b>Mathematics</b>	<b>131</b>	<b>116</b>	<b>88.5%</b>	<b>4.2</b>
MATH 125: Intermediate Algebra	44	43	97.7%	4.8
MATH 227: Statistics	52	41	78.8%	3.5
MATH 266: Calculus with Analytic Geometry II	35	32	91.4%	4.4
<b>Philosophy</b>				
PHILOS 006: Logic in Practice	24	23	95.8%	3.3
<b>Physics</b>				
PHYSICS 037: Physics for Engineers & Scientists I	26	13	50.0%	3.3
<b>Sociology</b>	<b>46</b>	<b>46</b>	<b>100.0%</b>	<b>3.8</b>
SOC 004: Sociological Analysis	29	29	100.0%	3.5
SOC 024: Social Psychology	17	17	100.0%	4.4

## Appendix 7: Assessment Results by Rubric Criteria: Criteria #4: Solving the Problem

Note: Discipline totals are included below only when more than one course from that discipline participated in the assessment.

	Number Assessed	Acceptable or Above	% Acceptable or Above	Average Rubric Score (out of 5.0)
<b>Total</b>	<b>418</b>	<b>346</b>	<b>82.8%</b>	<b>3.8</b>
<b>Gender</b>				
Female	247	213	86.2%	4.0
Male	171	133	77.8%	3.7
<b>Ethnicity</b>				
Hispanic	323	270	83.6%	3.8
White	37	28	75.7%	3.8
Asian	30	22	73.3%	3.7
Black	6	6	100.0%	4.3
Native American	2	2	100.0%	4.0
Pacific Islander	2	2	100.0%	5.0
Other/Unknown	18	16	88.9%	3.9
<b>Age</b>				
Under 18	2	2	100.0%	4.5
18-21	137	109	79.6%	3.7
22-25	147	118	80.3%	3.7
26-30	56	45	80.4%	3.9
31-40	33	29	87.9%	4.2
Over 40	43	43	100.0%	4.5
<b>Units Successfully Completed at LAMC</b>				
0 units	47	42	89.4%	4.1
1 to 15 units	47	38	80.9%	3.7
16 to 30 units	77	70	90.9%	4.1
31 to 45 units	79	63	79.7%	3.7
46 to 60 units	74	57	77.0%	3.7
Over 60 units	94	76	80.9%	3.8

## Appendix 7: Assessment Results by Rubric Criteria (cont.)

Note: Discipline totals are included below only when more than one course from that discipline participated in the assessment.

4) Solving the Problem (cont.)	Number Assessed	Acceptable or Above	% Acceptable or Above	Average Rubric Score (out of 5.0)
<b>Discipline/Course</b>				
<b>Accounting</b>				
ACCTG 002: Introductory Accounting II	18	11	61.1%	3.1
<b>Admin. of Justice</b>				
ADM JUS 005: Criminal Investigation	28	27	96.4%	4.6
<b>Art</b>				
ART 502: Beginning 3D Design	13	13	100.0%	3.8
<b>Biology</b>				
BIOLOGY 006: Molecular & Cell Biology	26	10	38.5%	2.9
<b>Child Development</b>				
CH DEV 045: Programs for Children with Special Needs	63	58	92.1%	4.4
<b>Culinary Arts</b>				
CLN ART 106: Purchasing & Receiving	43	40	93.0%	4.3
<b>Mathematics</b>	<b>131</b>	<b>105</b>	<b>80.2%</b>	<b>3.9</b>
MATH 125: Intermediate Algebra	44	39	88.6%	4.3
MATH 227: Statistics	52	36	69.2%	3.2
MATH 266: Calculus with Analytic Geometry II	35	30	85.7%	4.3
<b>Philosophy</b>				
PHILOS 006: Logic in Practice	24	23	95.8%	3.5
<b>Physics</b>				
PHYSICS 037: Physics for Engineers & Scientists I	26	13	50.0%	3.0
<b>Sociology</b>	<b>46</b>	<b>46</b>	<b>100.0%</b>	<b>3.7</b>
SOC 004: Sociological Analysis	29	29	100.0%	3.4
SOC 024: Social Psychology	17	17	100.0%	4.1