CSU Maritime Academy – Institution-Wide Assessment Council (IWAC)

AY 2017-18

Annual Learning Results Institution Wide SLO (C): Quantitative Reasoning

Report on ILO-C: Quantitative Reasoning

"Students will use numerical information to identify, analyze, and solve problems."

OBJECTIVES

- Measure the extent to which Cal Maritime students "use numerical information to identify, analyze, and solve problems."
- Give recommendations for improving assessment efforts.
- Give recommendations (where applicable) for improving program effectiveness.

METHODOLOGY

In the Academic Year 2017-2018, the IWAC conducted an assessment of the institution-wide student learning outcome C (ILO-C), Quantitative Reasoning. Data was gathered from assessments done by faculty in their courses using a common 6-point rubric. The rubric (Appendix A) contained a single dimension that was applied in each course to one or more assignments identified by the instructor as requiring an appropriate level of quantitative literacy. In total, 741 artifacts were gathered from 15 courses: CHE 105, CHE 110, ET 460, ME 394, MTH 100, MTH 107, MTH 210, MTH 211, MTH 395, NAU 310, NAU 410, PHY 100, PHY 120, PHY 200, and PHY 205. The distribution of artifacts spans all majors and academic classes and provides an accurate representation of the demographic profile of the University (Appendix B). Assessment scores were aggregated by major, graduation year, ethnicity and gender (Appendix C).

RESULTS AND DISCUSSION

Compared to prior assessments of Quantitative Reasoning, the number of artifacts collected was more comprehensive (741 vs. 392 artifacts in 2014) and more accurately representative of the demographic profile of the University (Appendix B). In particular, the current data includes a substantial increase in the artifacts captured from upper division courses, as was recommended by the 2014 assessment. We therefore believe that these results are more representative of student learning, and are statistically significant.

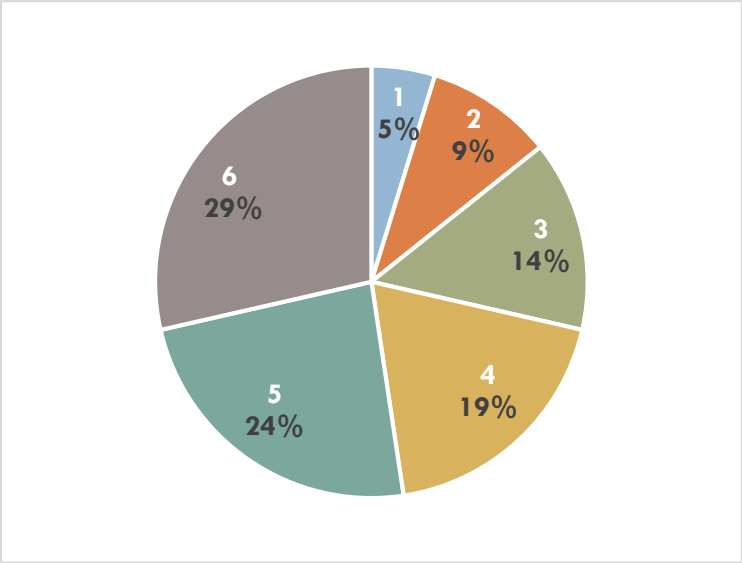
The rubric (Appendix A) used by all instructors was standardized using a six-point scale with a single dimension that could easily be applied to a variety of assignments in any discipline having a quantitative component.

As in prior assessment cycles, the benchmark was set for 70% of students to score 4 or above on a 6 point scale.

The benchmark was attained, with 70% of all students scoring 4 or above (Figure 1).

- Broken down by major (Figure 2), all majors reached the benchmark with the exception of FET (63%) and MET (63%).
- Broken down by academic class (Figure 3), 67% of freshman, 66% of sophomores, 56% of juniors, and 80% of seniors reached the benchmark.
- Broken down by gender (Figure 4), there was a significant gender gap with only 60% of female students reaching the benchmark compared to 72% for male students.
- Broken down by ethnicity (Figure 5), white students and students identifying as two or more ethnicities exceeded the benchmark, while Asian and Underrepresented Minority (URM) students did not reach the benchmark, with 66% and 63% of these students scoring greater than 4, respectively. (*URM designation includes American Indian, black, hispanic, and Pacific Islander*)

Figure 1. Assessment of ILO-C: Quantitative Reasoning
70% of All Students achieved benchmark



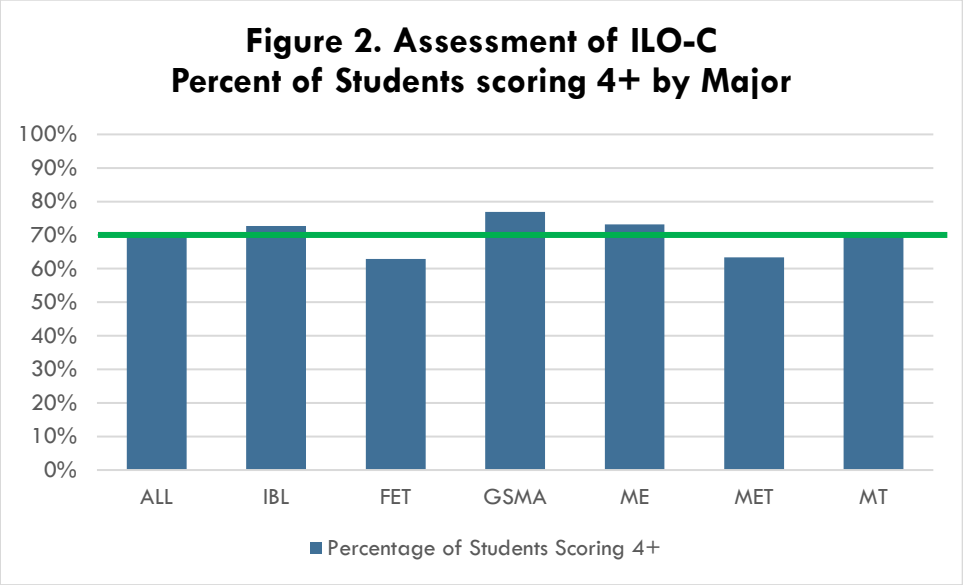


Figure 2. Assessment of ILO-C
Percent of Students scoring 4+ by Major
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
ALL
IBL
FET
GSMA
ME
MET
MT
Percentage of Students Scoring 4+

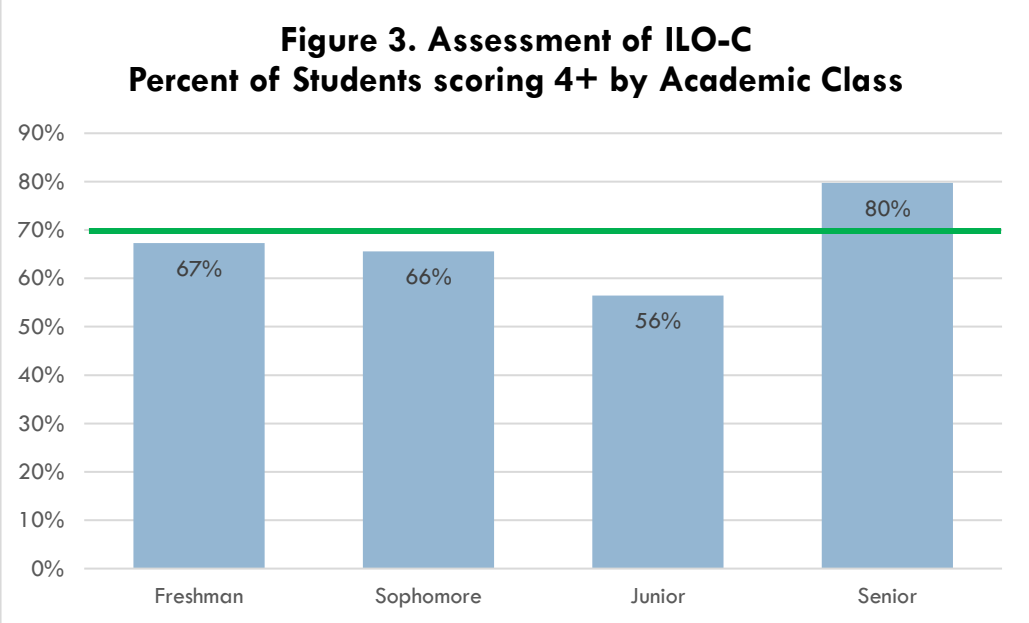


Figure 3. Assessment of ILO-C
Percent of Students scoring 4+ by Academic Class
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
67%
66%
56%
80%
Freshman
Sophomore
Junior
Senior

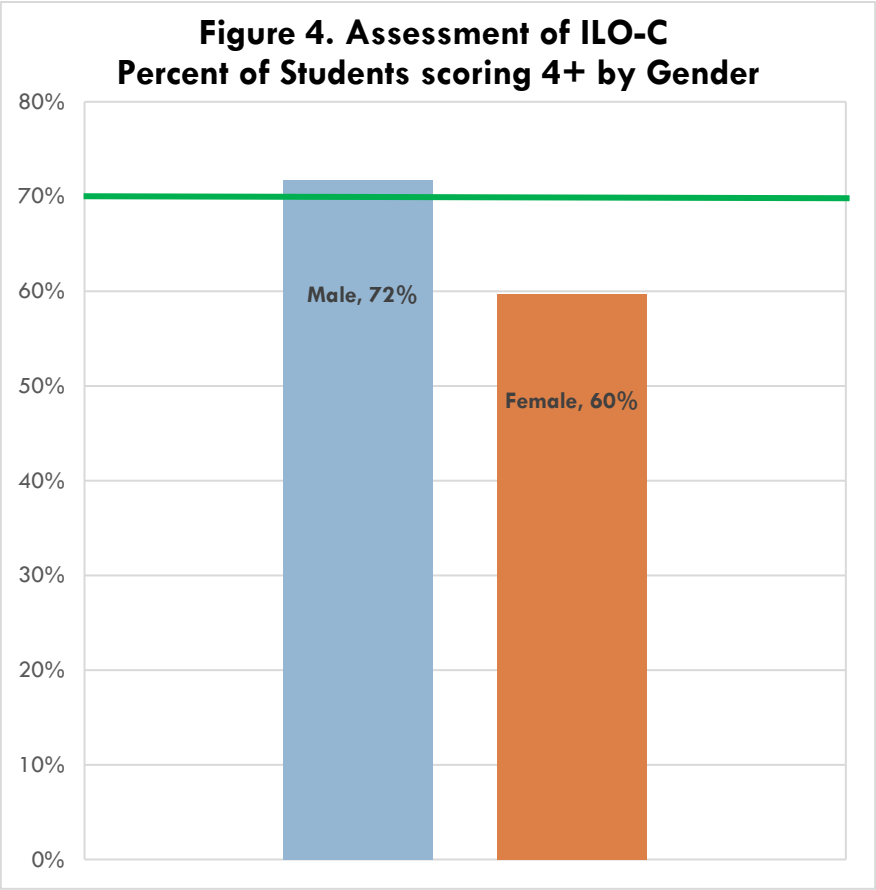


Figure 4. Assessment of ILO-C
Percent of Students scoring 4+ by Gender
80%
70%
60%
50%
40%
30%
20%
10%
0%
Male, 72%
Female, 60%

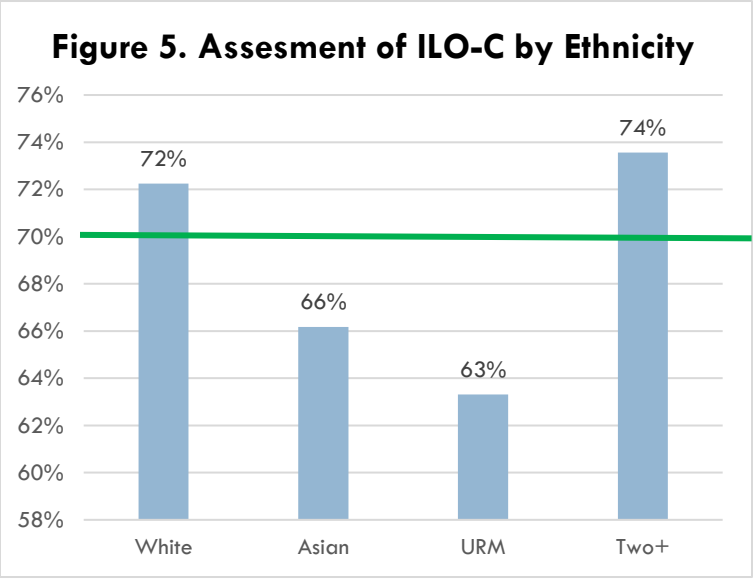


Figure 5. Assesment of ILO-C by Ethnicity
76%
74%
72%
70%
68%
66%
64%
62%
60%
58%
72%
66%
63%
74%
White
Asian
URM
Two+

RECOMMENDATIONS

IWAC recommends:

- Data collection process and formatting should be standardized.
- Supply assessment data to university advisors, registrar, and admissions for insights and recommendations regarding the gender and under-represented minorities gaps.
- The Department of Science & Mathematics should investigate indirect measures to further examine gender and under-represented minorities gaps relative to the benchmark.
- GSMA identify an upper division course to assess quantitative reasoning consistent with social science curriculum at peer institutions.
- IBL identify an upper division course to assess quantitative reasoning consistent with business curriculum at peer institutions.
- ET investigate performance gap relative to the benchmark in this subject area.

APPENDIX A: QUANITATIVE REASONING RUBRIC

ILO-C: "Use numerical information to identify, analyze and solve problems."

A person who is competent in quantitative reasoning possesses the skills and knowledge necessary to apply the use of logic, numbers, and mathematics to deal effectively with common problems and issues. A person who is quantitatively literate can use numerical, geometric, and measurement data and concepts, mathematical skills, and principles of mathematical reasoning to draw logical conclusions and to make well-reasoned decisions.

The benchmark for meeting this Student Learning Outcome will be a 4 or greater on this 6-point rubric.

	Initial (1-2)	Emerging (3)	Satisfactory (4)	Good (5)	Exemplary (6)
Demonstrate the ability to use numerical and/or symbolic information to identify, analyze and solve quantitative problems.	Demonstrates little or no understanding of what information and assumptions are needed to perform the analysis. Did not organize or calculate a mathematical strategy for a given situation, or did so in a completely invalid manner.	Demonstrates basic understanding of what information and assumptions are relevant to the analysis. Translation into mathematical symbols, graphs, and/or tables is flawed or incomplete. Approach and information gathering appears essentially effective, but includes major mistakes in organization or calculation	Demonstrates satisfactory understanding of what information and assumptions are relevant to the analysis, and translates into mathematical symbols, graphs, and/or tables with minor errors. Approach and information gathering appears essentially effective, but includes minor mistakes in organization or calculation	Demonstrates high level of understanding of what information and assumptions are relevant to the analysis, and correctly translate into mathematical symbols, graphs, and/or tables. Correctly organizes information in an appropriate form and calculates desired result with one minor error.	Demonstrates high level of understanding of what information and assumptions are relevant to the analysis, and correctly translate into mathematical symbols, graphs, and/or tables. Correctly organizes information in an appropriate form and calculates desired result with no errors.

APPENDIX B: TABULATED ASSESSMENT ARTIFACTS

Total Number of Artifacts for ILO-C during 2017-18 AY

	N	%	Fresh	Soph	Junior	Senior	PostBacc	M	F	M	F
BA	77	10.4%	31	25	9	12	0	64	13	83.1%	16.9%
FET	35	4.7%	7	11	2	15	0	33	2	94.3%	5.7%
GSMA	52	7.0%	26	13	5	8	0	41	11	78.8%	21.2%
ME	216	29.1%	115	41	11	46	3	186	30	86.1%	13.9%
MET	153	20.6%	65	35	11	37	5	128	25	83.7%	16.3%
MT	208	28.1%	22	32	48	99	7	175	33	84.1%	15.9%
ALL	**741**		**266**	**157**	**86**	**217**	**15**	**627**	**114**	**84.6%**	**15.4%**

Total Number of Artifacts for ILO-C during 2017-18 AY by COURSE, GENDER and CLASS

COURSE	N	MALE	FEMALE	%M	%F	Fresh	Soph	Junior	Senior	PostBacc
CHE105	34	29	5	85%	15%	25	7	1	1	0
CHE110	74	62	12	84%	16%	67	2	2	3	0
ET460	34	30	4	88%	12%	0	0	0	33	1
ME394	35	30	5	86%	14%	0	0	0	34	1
MTH100	52	34	18	65%	35%	32	6	6	8	0
MTH107	66	60	6	91%	9%	11	29	9	17	0
MTH210	23	18	5	78%	22%	22	1	0	0	0
MTH211	37	32	5	86%	14%	30	7	0	0	0
MTH395	12	9	3	75%	25%	0	0	0	10	2
NAU310	77	61	16	79%	21%	0	12	40	22	3
NAU410	74	65	9	88%	12%	0	0	0	70	4
PHY100	21	17	4	81%	19%	0	12	5	4	0
PHY120	25	24	1	96%	4%	17	6	2	0	0
PHY200	145	127	18	88%	12%	62	55	11	13	4
PHY205	32	29	3	91%	9%	0	20	10	2	0
ALL	**741**	**627**	**114**	**85%**	**15%**	**266**	**157**	**86**	**217**	**15**

Rubric Scores for ILO-C during 2017-18 AY by PROGRAM

SCORE	ALL	BA	FET	GSMA	ME	MET	MT
1	44	2	4	1	11	24	2
2	72	11	4	5	16	15	21
3	107	8	5	6	31	17	40
4	150	23	5	21	38	29	34
5	165	13	9	8	46	33	56
6	203	20	8	11	74	35	55
COUNT	**741**	**77**	**35**	**52**	**216**	**153**	**208**

Rubric Scores for ILO-C during 2017-18 AY by PROGRAM

SCORE	ALL	BA	FET	GSMA	ME	MET	MT
1	6%	3%	11%	2%	5%	16%	1%
2	10%	14%	11%	10%	7%	10%	10%
3	14%	10%	14%	12%	14%	11%	19%
4	20%	30%	14%	40%	18%	19%	16%
5	22%	17%	26%	15%	21%	22%	27%
6	27%	26%	23%	21%	34%	23%	26%
BENCHMARK	**70%**	**73%**	**63%**	**77%**	**73%**	**63%**	**70%**

Rubric Scores for ILO-C during 2017-18 AY by STUDENT CLASS

SCORE	ALL	Fresh	Soph	Junior	Senior	PostBac
1	44	33	6	1	4	0
2	72	29	16	11	16	0
3	107	25	32	25	24	1
4	150	61	29	15	40	5
5	165	37	37	22	64	5
6	203	81	37	11	69	4
N	**741**	**266**	**157**	**85**	**217**	**15**

Rubric Scores for ILO-C during 2017-18 AY by STUDENT CLASS

SCORE	ALL	Fresh	Soph	Junior	Senior	PostBac
1	6%	12%	4%	1%	2%	0%
2	10%	11%	10%	13%	7%	0%
3	14%	9%	20%	29%	11%	7%
4	20%	23%	18%	18%	18%	33%
5	22%	14%	24%	26%	29%	33%
6	27%	30%	24%	13%	32%	27%
BENCHMARK	**70%**	**67%**	**66%**	**56%**	**80%**	**93%**

*benchmark is scoring 4 or above on 6-point rubric scale

Rubric Scores for ILO-C during 2017-18 AY by GENDER

SCORE	MALE	FEMALE
1	34	10
2	54	18
3	89	18
4	119	31
5	150	15
6	181	22
N	**627**	**114**
% Benchmark	**72%**	**60%**

Rubric Scores for ILO-C during 2017-18 AY by ETHNICITY

SCORE	ALL	White	Asian	URM*	Two+	Unknown
1	6%	5%	9%	7%	5%	10%
2	10%	9%	9%	13%	10%	6%
3	14%	14%	16%	17%	11%	12%
4	20%	17%	21%	27%	22%	17%
5	22%	24%	24%	18%	22%	19%
6	27%	30%	22%	19%	30%	37%
BENCHMARK	**70%**	**72%**	**66%**	**63%**	**74%**	**73%**
N	**741**	**364**	**68**	**169**	**87**	**52**

*URM includes American Indian, black, hispanic, and Pacific Islander