

Academic Assessment Report - AY 2012-2013

College, School/Department, Name of Program:

Program SLOs:

(List Program SLOs)

SLO1: Demonstrate a firm understanding of basic chemical principles as demonstrated by the reviewing of the primary literature and dictated by the American Chemical Society. (KU 1, 4) (GE K1, S3, S4, S5, GEV5)

Direct Measure:

- 1) Departmental and ACS scores to show mastery of concepts and consistency throughout the sections.
- 2) CHEM 4908: Research paper scored with rubric to demonstrate achievement of program goals. Department generated rubrics are attached.

Indirect Measure: Graduating Senior Survey

SLO2: Analyze multiple sources of data to synthesize scientific conclusions. . (KU 1, 4) (GE K1, S3, S4, S5)

Direct Measure:

- 1) CHEM 2491 Term Paper with same basic (applied at a less rigorous level) rubrics as the CHEM 4908
- 2) CHEM 4908: Research paper scored with rubric to demonstrate achievement of program goals.

Indirect Measure: Graduating Senior Survey

SLO3: Articulate the importance of chemical issues in the context of it's impact on society. (KU 1, 3, 4) (GE K1, S1,S2, S3, S4, S5)

Direct Measure:

- 1) CHEM 3383: The students will have to show real world application in the "Heat Capacity Ratio"
- 2) CHEM 4908: Research paper scored with rubric to demonstrate achievement of program goals.

Indirect Measure: Graduating Senior Survey

SLO4: Report and present chemical issues with modern technology in correct scientific format. (KU 1, 4) (GE K3, S1, S2, S5)

Direct Measure:

- 1) CHEM 2491: Students will present their research paper to the class using the GE and departmental rubrics.
- 2) CHEM 4908: Presentation of Research thesis scored with rubric to demonstrate achievement of program goals.

Indirect Measure: Graduating Senior Survey

*** KU Student Outcomes: *Kean University graduates should be able to:***

1. Think critically, creatively and globally;
2. Adapt to changing social, economic, and technological environments;
3. Serve as active and contributing members of their communities; and
4. Advance their knowledge in the traditional disciplines (GE) and enhance their skills in professional areas (Prof. pgms)

****General Education Student Learning Outcomes**

Student Learning Outcomes – Knowledge: Students will demonstrate proficiency in knowledge and content by:

- (K1) applying the scientific method to understand natural concepts and processes;
- (K2) evaluating major theories and concepts in social sciences;
- (K3) relating historical references to literature; and
- (K4) evaluating major theories and concepts in the fine arts.

Student Learning Outcomes – Skills: Students will demonstrate the skills necessary to:

- (S1) write to communicate and clarify learning ;
- (S2) communicate effectively through speech;
- (S3) solve problems using quantitative reasoning;
- (S4) think critically about concepts in multiple disciplines; and
- (S5) show information literacy.

Student Learning Outcomes –Values: Students will exhibit a set of values that demonstrates:

- (GEV1)personal responsibility
- (GEV2)ethical and social responsibility
- (GEV3)social and civic engagement
- (GEV4)respect for diverse cultures and perspectives
- (GEV5) life-long learning

Program Level Student Learning Outcomes <i>(Add rows for additional SLOs)</i>	Assessment Measure(s) <i>(Add rows if necessary)</i>	Assessment Criteria <i>(Describe how data is collected--rubric, survey, etc.)</i>	Results of Assessment <i>(Specific to Data Collected)</i>	Action Taken <i>(Closing the Loop: New action or follow up from last Assessment Report)</i>
SLO #1	Direct: Research papers scored with rubrics to demonstrate achievement of program goals	Rubrics-attached	The CHEM 4908 (Chemistry Capstone Course) research paper average was a 4.67/5.0 on the accuracy of the presented science. A breakdown of the lower classes is presented below this grid.	This is the first year we have detailed data from the updated rubric. Next year the same rubric will be used to compare this year and next year's data before changes are made.
	Indirect Graduating Senior Survey:	Greater emphasis will be placed on requiring students to complete the survey so that a statistically significant results can be obtained	Out of 15 graduating seniors only 1 person returned the survey; therefore, the results are not statistically significant.	Next year we need to make completion of the graduating senior survey part of the grade so that we can obtain statistically useful data.
SLO #2	Direct: Research papers scored with rubrics to demonstrate achievement of program goals	Rubrics-attached	CHEM 4908 achieved this goal as the 4.94/5.0 on the rubric. CHEM 2491 was run in the semester impacted by Hurricane Sandy. With the loss of 2 weeks (and further impact to students) the paper/presentation had to be eliminated as students had limited resources to electricity and could not create presentations.	Next year we will be able to collect data as; hopefully, we will not be impacted by a natural disaster.
	Indirect: Graduating Senior Survey		Out of 15 graduating seniors only 1 person returned the survey; therefore, the results are not statistically significant.	Next year we need to make completion of the graduating senior survey part of the grade so that we can obtain statistically useful data.

SLO #3	Direct: Articulate the importance of chemical issues in the context of it's impact on society	Rubrics-attached	The CHEM 4908 (Chemistry Capstone Course) research paper average was a 3.50-3.60/5.0 on advances and limitation of the topic under study	Next year we need to make completion of the graduating senior survey part of the grade so that we can obtain statistically useful data
	Indirect: Graduating Senior Survey		Out of 15 graduating seniors only 1 person returned the survey; therefore, the results are not statistically significant.	Next year we need to make completion of the graduating senior survey part of the grade so that we can obtain statistically useful data.
SLO #4	Direct: Report and present chemical issues with modern technology in correct scientific format	Rubrics-attached	The CHEM 4908 (Chemistry Capstone Course) research paper average was a 4.00-5.00/5.0 on the presentations.	This is the first year we have detailed data from the updated rubric. Next year the same rubric will be used to compare this year and next year's data before changes are made.
	Indirect: Graduating Senior Survey		Out of 15 graduating seniors only 1 person returned the survey; therefore, the results are not statistically significant.	Next year we need to make completion of the graduating senior survey part of the grade so that we can obtain statistically useful data.

Chemistry Department Assessment Initiatives

CHEM 1083/1084/2581/2582 had a common syllabus and a uniform final exam. CHEM 1083 and CHEM 2581 had a departmentally generated final exam and CHEM 1084 and CHEM 2582 took the American Chemical Society exam so that scores from Kean University can be compared to national norms.

CHEM 1083

CHEM 2581 There were 4 sections of CHEM 2581 running as double sections. The averages for the department final of the double sections were within acceptable means 28. (sections 01,03) and 27 (sections 04 and 05-section 2 did not run this semester)

CHEM 2582 There were 5 sections of CHEM 2582 running as 2 double sections and 1 single section. The averages for the national final of the double sections were within acceptable means (22 and 21) and the single section was higher (27). The disparity can be attributed to the single section having a large withdraw population and more individualized attention (50+ students versus 22 students). The national average is still be calculated by the American Chemical Society so this report will be updated when the ACS releases the national average.

CHEM 3581

The final average for the course on the ACS final was 23.31 this was between the percentiles of 24 and 28 using ACS data (Composite Norms). While this may seem low, it is within one standard deviation of the mean. The standard deviation being 9.34 and the mean being 30.49 according to Composite Norms of the ACS for the 2007 Biochemistry Exam.

CHEM 3381-Physical Chemistry Lecture I-The American Chemical Society Physical Chemistry (Thermodynamic portion) Exam was given in Fall 2012. The average was 22.2/50 with a standard deviation of 1.0. This average is consistent with the last 6 years of data with averages 24.9, 24.8, 24.2, 24.8, 23.9, 23.5. Although these scores are consistent with national norms in this subject. they exhibit a slightly decreasing trend.

A large fraction of students consistently have difficulty with less concrete, cumulative exams such as the ACS test. In order to improve their comprehension with more abstract concepts, POGIL (Process Oriented Guided Inquiry Learning) activities have been incorporated into some lecture and numerous recitation classes during this seven year period. While there is no quantitative improvement in ACS test scores over this period, higher performing students show improved verbalization and analysis during class discussion. A significant fraction of weaker performing students fall into two categories: (1) transfer students with very poor background in general chemistry concepts which are essential for understanding the course material and (2) students who have registered without the course prerequisites even though they have been advised that they are not qualified. Mandatory screening for prerequisites would help improve both the class morale and collective achievement.

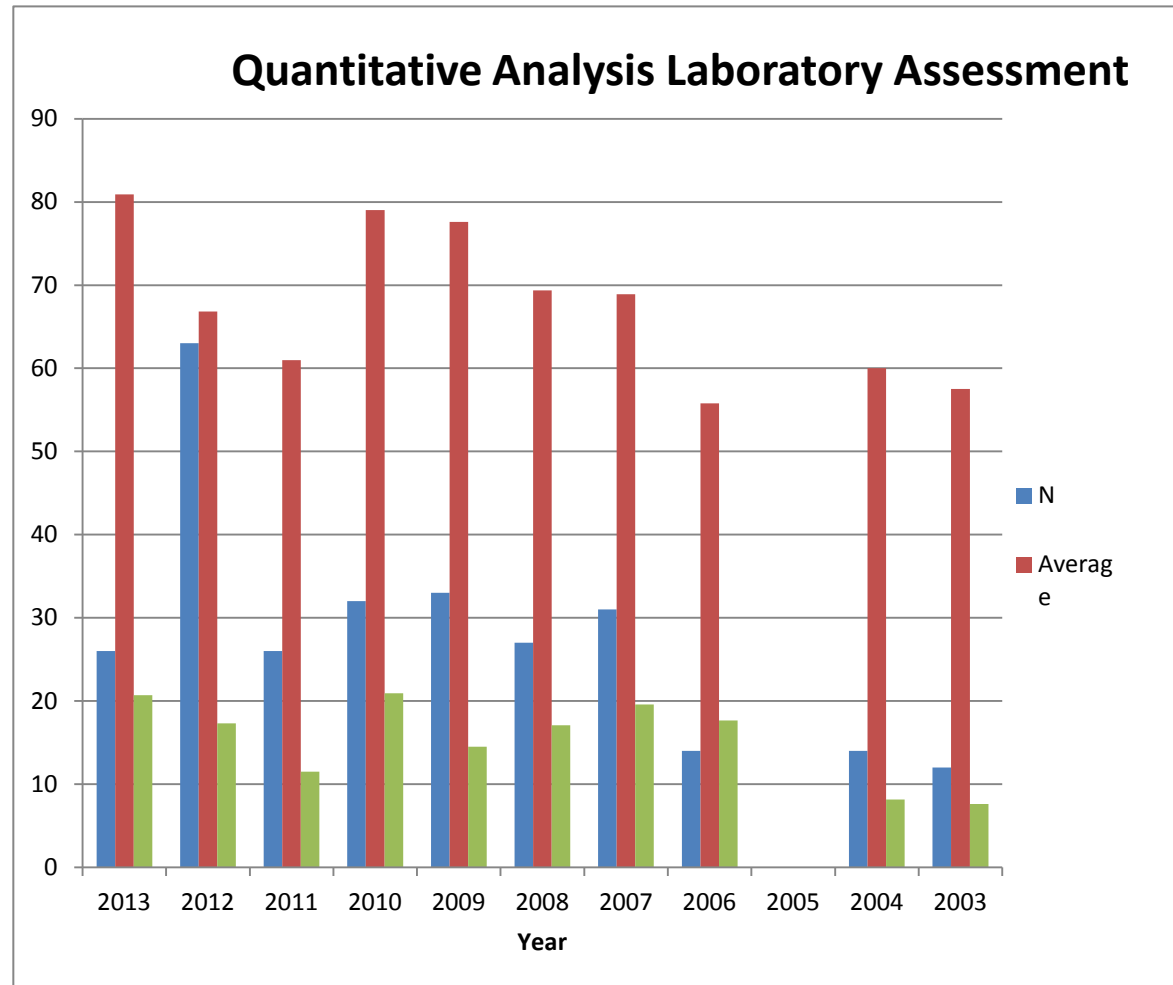
Quantitative Analysis Assessment Examination

	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
N	26	63	26	32	33	27	31	14	Data	14	12
Average	80.9	66.8	61.0	79.0	77.6	69.4	68.9	55.8	Missing	60.0	57.5
Std Dev	20.7	17.3	11.5	20.9	14.5	17.1	19.6	17.7		8.2	7.6
	98	70.0	50.0	55.0	80.0	60.0	45.0	70.0		70.0	50.0
	91	55.0	70.0	40.0	65.0	40.0	75.0	80.0		68.0	55.0
	94	55.0	50.0	65.0	85.0	65.0	40.0	50.0		55.0	55.0
	90	65.0	60.0	50.0	55.0	60.0	45.0	54.0		68.0	55.0
	89	45.0	40.0	75.0	75.0	35.0	50.0	35.0		57.0	66.0
	98	35.0	65.0	70.0	60.0	70.0	55.0	95.0		65.0	50.0
	100	65.0	60.0	70.0	50.0	65.0	65.0	65.0		57.0	55.0
	92	55.0	70.0	75.0	75.0	50.0	60.0	40.0		42.0	57.0
	89	55.0	70.0	40.0	85.0	75.0	70.0	45.0		59.0	55.0
	88	60.0	50.0	100	85.0	55.0	70.0	50.0		65.0	72.0
	97	65.0	65.0	95	60.0	70.0	60.0	30.0		67.0	70.0
	92	55.0	60.0	100	60.0	50.0	70.0	50.0		47.0	50.0
	100	45.0	85.0	93	60.0	65.0	40.0	53.0		60.0	
	97	50.0	50.0	92	85.0	45.0	45.0	64.0		60.0	
	88	55.0	65.0	100	50.0	99.0	85.0				
	87	70.0	70.0	100	65.0	96.0	100.0				
	86	70.0	50.0	100	60.0	95.0	98.0				
	83	65.0	45.0	92	96	90.0	92.0				
	76	60.0	45.0	90	85	86.0	92.0				
	71	70.0	65.0	100	92	84.0	90.0				
	69	40.0	70.0	95	84	81.0	90.0				
	61	80.0	75.0	100	80	80.0	89.0				
	61	35.0	80.0	100	96	79.0	88.0				
	57	70.0	65.0	90	100	78.0	88.0				
	32	55.0	60.0	89	87	76.0	85.0				
	18	80.0	50.0	85	82	64.0	78.0				
		75.0		83	79	60.0	66.0				

2013 consists of partial data.

65.0	70	94	63.0
100	67	87	61.0
85	63	98	47.5
95	60	92	33.0
80	25	78	
73		76	

100
100
90
78
70
95
87
100
95
70
60
60
60
59
55
55
55
45



Comments

Quantitative Methods of Analysis has traditionally been a laboratory based course where student apply theoretical aspects of Chemistry to practical laboratory experiences. Therefore an assessment of laboratory concepts is important in order to gauge students' understanding and level of achievement and to provide information to improve the laboratory experience. The course is taken by Chemistry majors, STEM students, and Biology majors who are seeking a Minor in Chemistry. The prerequisite is a complete year of General Chemistry with a grade of C or better. The data set consists of a total of 278 students over a 10 year period. The average of the results for each year is provided but the composite of all the averages is 68%. There is no noticeable trend in the average but there is somewhat of a drift in an upward direction. The 2013 data is partial and therefore its average is not reliable.

Recommendations: There are no national norms to compare to since this is an internal examination. It does imply the need to perform item analysis in order to identify the areas of weakness. It is suggested that an item analysis be performed on any existing exams still on file and also on future exams to ascertain areas that are in need of reinforcement and remediation. Because student results on the exam are related to their understanding of the specific chemistry involved in the experimental procedure, a modification of the laboratory manual may prove useful. Inclusion of greater chemical detail, prelaboratory and post-laboratory questions would strengthen better comprehension.

ACS Analytical Examination Data

Fall 2011*	Normalized		Fall 2012	ACS % F12	Raw Score out of 50 Spr- 2013	ACS %
	Data	ACS% F11				
14	30	61	27	54	10	20
13	28	57	26	52	12	24
13	28	57	26	52	12	24
13	28	57	24	48	28	56
11	24	48	24	48	15	30
11	24	48	23	46	11	22
10	22	43	21	42	24	48
10	22	43	20	40	19	38
10	22	43	19	38	20	40
10	22	43	18	36	18	36
9	20	39	18	36	12	24
7	15	30	17	34	16	32
6	13	26	17	34	20	40
6	13	26	15	30	11	22
			15	30	19	38

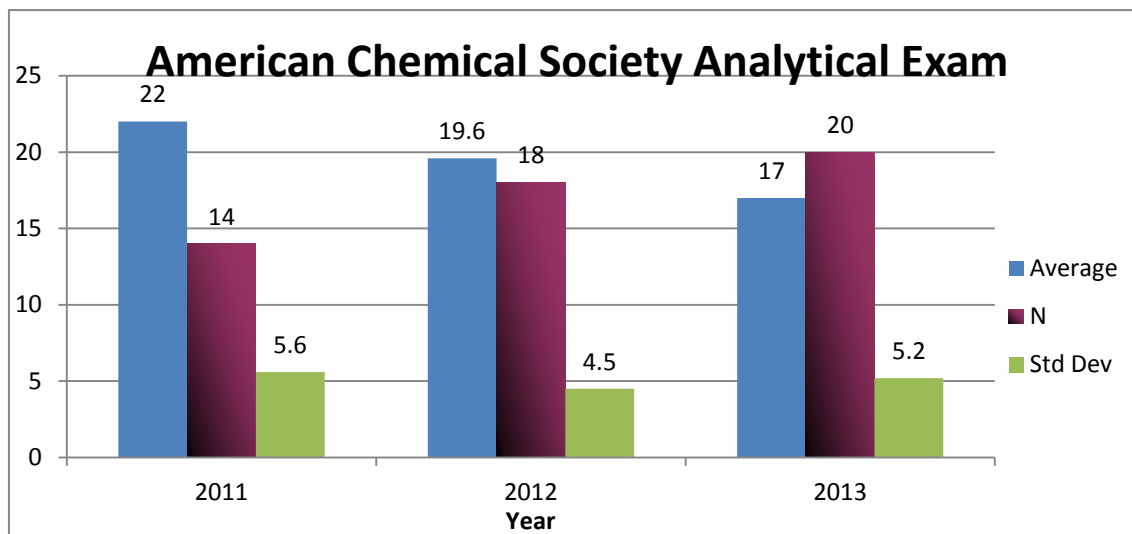
				14	28		15	30
				14	28		23	46
				14	28		16	32
							14	28
							25	50
Average		10.2	22	44	19.6	39.1	17.0	34.0
N		14	14		18		20	
Std Dev		2.6	5.6		4.5		5.2	
ACS Avg	28							
ACS S.D.	7							

Data Summary

	2011	2012	2013
Average	22	19.6	17
N	14	18	20
Std Dev	5.6	4.5	5.2

* Fall 2011 only the instrumental questions were asked, not the quant questions
 Pro-Rate mean that the 23 questions answered are scaled to 50 question equivalent
 Percent - ACS % means percent correct out of 50 total

1.6 SD Dev from Norm



The data set is very limited, N=52, The ACS exam has been given over the past three years and the overall average is significantly below the national norms for this exam (National norms are calculated from a test subset of 369 students from 17 colleges and universities in the country.) The number of institutions that are ACS certified in the United States is over 650. The analyzed data appears to provide averages that fall within 1.1 to 1.5 standard deviations below the national norms.

Rationale for Low Results

The Analytical exam is a composite of both Quantitative Methods and Instrumental Methods but is heavily weighted towards Quantitative Methods. Unfortunately, the exam is given after the second semester sequence course, Instrumentation, and much of the Quantitative material has been forgotten.

Also, there has been a large influx of students who are considered Chemistry Minors whose backgrounds are somewhat weaker than Many students also tend to come into the course without the appropriate pre-requisites. Prerequisite screening is necessary Especially among minors. Additionally, separate cumulative examinations in Quantitative and Instrumental Methods would pull together and reinforce the content of both courses. Results should be better if the exam were split into two parts -Quantitative and Instrumental content- and given after each respective course.

CHEM 4481/4483: The Kean University student average for 24.3 for the Inorganic Chemistry test, which is below the national average.