

University of Guam
College of Natural and Applied Sciences (CNAS)
CNAS Assessment Committee

I. CHEMISTRY SUMMARY OF ASSESSMENT ACTIVITIES

Activity	Description of Activity	Date of Implementation	Date for Completion	Update
1. Spring 2007 WASC Poster Presentation of Assessment Plans	Program Learning Objective Assessment Plan	AY 2007-2008	Fall 2008	Submitted poster to CNAS Assessment Committee January 2007 for WASC Poster Session; Contact Chair of CNAS Assessment Committee for details (htaijeron@yahoo.com).
	General Education Learning Objective Assessment Plan	AY 2007-2008	Indefinite	Submitted poster to CNAS Assessment Committee January 2007 for WASC Poster Session; Contact Chair of CNAS Assessment Committee for details (htaijeron@yahoo.com).
2. Degree Program Review Report	Program Review Closing the Loop Report; Date Covered by Review: 1996-2000	Fall 2008	Fall 2008	Forwarded Program Review Closing the Loop Report to university EET-AQ Committee September 2008; Contact Chair of CNAS Assessment Committee for details (htaijeron@yahoo.com).
3. Chemistry Degree Program SLOs	Finalize Degree Program SLOs	Fall 2007	Spring 2008	See 2008-2009 UOG Catalog; Go back to the SLOs/CMs icon in this website for details.
4. Insertion of SLOs in Course Outlines and Syllabi, Curricular Mappings	Insertion of defined SLOs in Course Outlines	Spring 2008	September, 2008	Approved by CNAS-AAC and CNAS Dean; Go back to the Course Outlines icon in this website for details.
	Insertion of defined SLOs in Course Syllabi (proposed course syllabus template only)	Fall 2008	December, 2008	Go back to the Course Syllabi icon in this website for details.
	Curricular Mappings	Spring 2008	Fall 2008	Go back to the SLOs/CMs icon in this website for details.
5. CNAS Assessment Chemistry Subcommittee on Chemistry Assessment Activities	Chemistry Faculty Presentation of Chemistry Updated Assessment Plans/Reports/Activities to CNAS Faculty.	Fall 2007	Spring 2008	Updated Assessment Plans/Reports/Activities for Chemistry presented to CNAS Faculty February 2008.
	Chemistry Assessment Exemplar Report to University EET-AQ Committee	Fall 2008	Fall 2008	Submitted by Dr. Maika Vuki to CNAS Assessment Committee September 2008 and forwarded to university EET-AQ Committee; See Section II below for details.
	Chemistry Assessment Update and Report for AY 2007-2008	Fall 2007	July, 2008	Dr. Vuki submitted report to CNAS Assessment Committee Summer 2008; See Section III below for details.
	Chemistry Quantitative Skills Assessment Rubrics	Fall 2007	July, 2008	Dr. Vuki submitted Chemistry Rubrics to CNAS Assessment Committee Summer 2008; See Section III below for details.
	Dr. Vuki's Attendance @ WASC Assessment Conference @ CAL POLY POMONA	Fall 2007	Fall 2007	Dr. Vuki presented his report fall 2007 to CNAS Assessment Committee.

II. IDENTIFICATION OF CHEMISTRY ASSESSMENT EXEMPLARS

ASSESSMENT ACTIVITY	SUMMARY OF OUTCOMES AND CHANGES
1. CH102 and CH103: Pre- and Post test; Normal Test analysis using a rubric adapted to assess the quantitative skills.	Assessment results show students difficulty in integrating two or more concepts for solving quantitative problems. We emphasize on quizzes as one area to re-enforce their learning skills. The frequency of spot quizzes was increased together with its weighting in the overall assessment. Test results from Fall 2008 show some marked improvement in student overall performance. Student participation in class has also increased as these problem solving exercises are discussed. Exam were also split to two parts (mid-term and end of semester final) to enable students to prepare well.
2. CH100, CH102, CH103, CH310 Laboratories. Assessment rubrics for some laboratory exercises and in the laboratory practical exam were issued before the task	Students had a very clear expectation under the categories listed. The level of competence in conducting experimental exercise was better. The supervision effort was less demanding for the faculty. However the calculation based on theoretical quantitative problems show some deficiencies. A similar approach based increase emphasis on spot quizzes is currently tested.
3. Chemistry Program student learning outcomes	All chemistry courses student learning outcomes have been revised. The involvement of all faculty members has helped in identifying the major focus of the assessment activity.
4. Chemistry Program assessment seminar	Chemistry faculty presented results of assessment to the college. Some feed back on data analysis and interpretation was considered for improvement.
5. Chemistry Program Goals	The program goals have been revised and linked to the SLO and is presently used for assessment and course revision.
6. Chemistry Student Seminar Introduced to two courses	One area that became obviously lacking from the revised SLO was on the communication and research skills. Student's seminar presentation was included in two courses and is currently monitored.
7. CH101 and CH101L A 4 credit course with lecture and lab	This course was separated to 3 + 1 credit hours to clearly project the laboratory and lecture components. Faculty teaching load are clearly defined and less confusion on students for class timetable
8. American Chemical Society standardized exam	These exams have been used in some of our courses for a number of years. Data analyses on the results show some high and low performance which was attributed to the cohort of students at those periods. The overall results compares well to the national average.

III. DETAILED SUMMARY OF AY 2007-2008 ASSESSMENT STUDY REPORTS SUBMITTED BY CHEMISTRY FACULTY

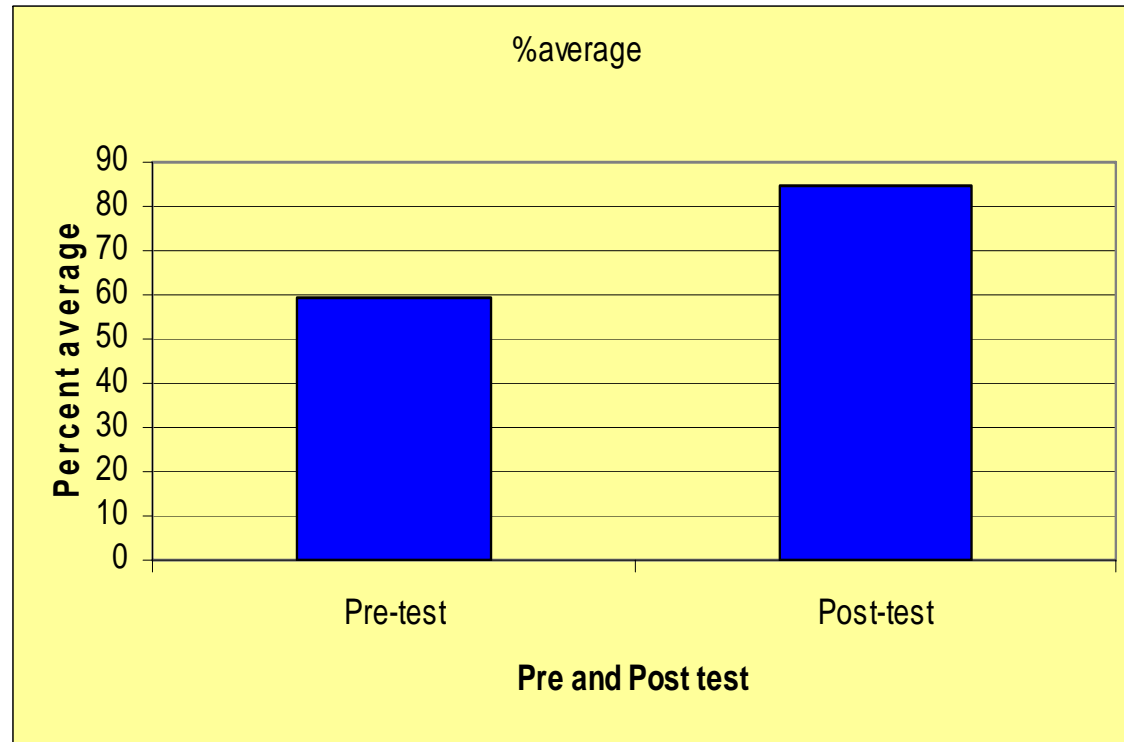
A. Assessment Plans and Recommendations

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<p>The chemistry department assessment was drawn from the program objectives that were presented as the Chemistry Program Assessment plan in 2007 (For details on these program objectives, go back to the SLOs/CMs icon in this website).</p> <p>1. The following goal/objective was selected for assessment:</p> <p>Goal #4: : <i>Demonstrate critical thinking, problem solving skills and the ability to use chemical knowledge and mathematical skills to identify, evaluate, analyze, synthesize, and integrate data and abstract ideas in solving problems.</i></p> <p>Objective #2: <i>Students should be able to solve qualitative & quantitative problems.</i></p> <p>2. Assessment Methods Selected for Assessment:</p> <ol style="list-style-type: none"> Pre- and post-test (For multiple section courses, the same pre- and post test was used. Drs. Balakrishnan and Vuki conducted pre- and post-test for CH100, CH102, and CH103. Dr. Suleman conducted pre- and post-test for CH310a and CH310b); Analysis of specific questions that deals with quantitative skills from the normal exam (This method saves the effort of preparing a separate set of questions, but it involves keeping copies of the exam scripts to carry out data analysis); Giving embedded questions in a normal exam (This method is currently being conducted and no data is available but the results from the two methods stated are reported in this updated assessment report). <p>3. Chemistry Quantitative Skills Assessment Rubrics Used</p> <table border="1" data-bbox="236 852 1714 1399"> <thead> <tr> <th></th> <th>Student preparation level</th> <th>Insufficient</th> <th>Fair</th> <th>good</th> <th>Very good</th> <th>excellent</th> </tr> </thead> <tbody> <tr> <td></td> <td>Types of quantitative skills</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> </tr> <tr> <td>A</td> <td>Data collection, organization and recognition</td> <td>Mostly wrong, major mistakes, no organization or understanding data</td> <td>Some correct, several major mistakes, unorganized, limited understanding</td> <td>Minimum acceptable work, many minor mistakes, some understanding</td> <td>Adequate level of work, could be improved, several minor mistakes, good level of understanding</td> <td>Exemplary work, well organized, excellent understanding</td> </tr> <tr> <td>B</td> <td>Calculations skills using basic formula</td> <td>Mostly wrong, major mistakes, no organization or understanding data</td> <td>Some correct, several major mistakes, unorganized, limited understanding</td> <td>Minimum acceptable work, many minor mistakes, some understanding</td> <td>Adequate level of work, could be improved, several minor mistakes, good level of understanding</td> <td>Exemplary work, well organized, excellent understanding</td> </tr> <tr> <td>C</td> <td>Calculation with complex equation, solving complex algebra</td> <td>Mostly wrong, major mistakes, no organization or understanding data</td> <td>Some correct, several major mistakes, unorganized, limited understanding</td> <td>Minimum acceptable work, many minor mistakes, some understanding</td> <td>Adequate level of work, could be improved, several minor mistakes, good level of understanding</td> <td>Exemplary work, well organized, excellent understanding</td> </tr> <tr> <td>D</td> <td>Interpretation of data, numbers, chemical concepts</td> <td>Mostly wrong, major mistakes, no organization or understanding data</td> <td>Some correct, several major mistakes, unorganized, limited understanding</td> <td>Minimum acceptable work, many minor mistakes, some understanding</td> <td>Adequate level of work, could be improved, several minor mistakes, good level of understanding</td> <td>Exemplary work, well organized, excellent understanding</td> </tr> </tbody> </table>		Student preparation level	Insufficient	Fair	good	Very good	excellent		Types of quantitative skills	1	2	3	4	5	A	Data collection, organization and recognition	Mostly wrong, major mistakes, no organization or understanding data	Some correct, several major mistakes, unorganized, limited understanding	Minimum acceptable work, many minor mistakes, some understanding	Adequate level of work, could be improved, several minor mistakes, good level of understanding	Exemplary work, well organized, excellent understanding	B	Calculations skills using basic formula	Mostly wrong, major mistakes, no organization or understanding data	Some correct, several major mistakes, unorganized, limited understanding	Minimum acceptable work, many minor mistakes, some understanding	Adequate level of work, could be improved, several minor mistakes, good level of understanding	Exemplary work, well organized, excellent understanding	C	Calculation with complex equation, solving complex algebra	Mostly wrong, major mistakes, no organization or understanding data	Some correct, several major mistakes, unorganized, limited understanding	Minimum acceptable work, many minor mistakes, some understanding	Adequate level of work, could be improved, several minor mistakes, good level of understanding	Exemplary work, well organized, excellent understanding	D	Interpretation of data, numbers, chemical concepts	Mostly wrong, major mistakes, no organization or understanding data	Some correct, several major mistakes, unorganized, limited understanding	Minimum acceptable work, many minor mistakes, some understanding	Adequate level of work, could be improved, several minor mistakes, good level of understanding	Exemplary work, well organized, excellent understanding	<ol style="list-style-type: none"> Assessment Results (See Section IIIB below) Recommendations for Improvements <ol style="list-style-type: none"> Emphasize key problems that involve synthesis if information in the course reviews and give more worked out examples; Review syllabus and identify where more emphasis is needed; Give regular quizzes to engage student on the level of requirement; Split final exams into two sections. One to be administered in the middle of semester covering the completed topics and the second at the end of semester that will cover the rest of topics; Conduct assessment with American Chemical Society Standard Exams; Record Review sessions on video or DVD so that students can review at their own pace and hence spend more time in understanding the concepts; Set up a resource center that student could access help, books, tutors, software; Refine the test questions for assessment and conduct assessment.
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B. Summary of Assessment Results

1. The results from the pre- and post-exams for CH100

a. Figure 1.0. Average score for the CH100 student at pre-test and post-test:



The results show a general improvement on student's performance. However, the level of improvement is not so significant considering that many of them show adequate level of subject knowledge from the pre-test results of about 60%.

b. The same set of results from Figure 1.0 was analyzed under the assessment rubric. Since the focus of the assessment was quantitative skills, a selection of quantitative questions from the test was identified and applied under the rubrics. The results are as plotted in Figure 2.0.

Figure 2.0. Pre and Post Test analysis for CH100 under the assessment rubric. Plot of difficulty factor as a function of learning categories.

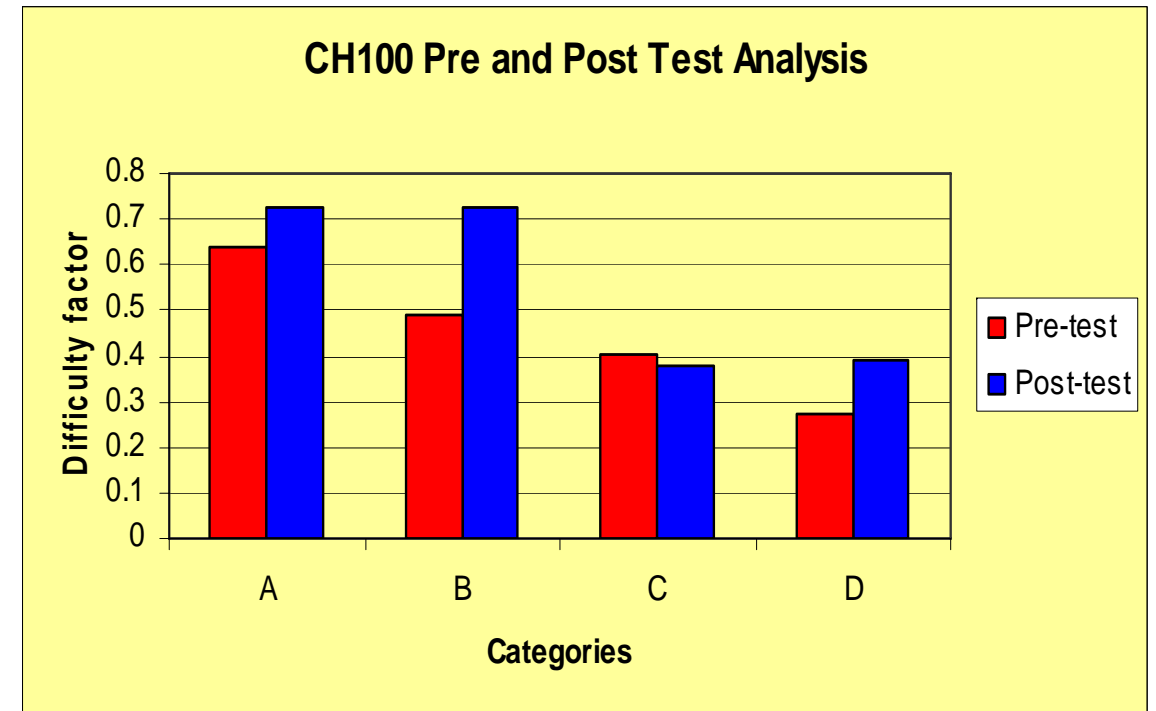


Figure 2.0 clearly show that students performed better under categories A and B compared to categories C and D. While post test appears to show slight improvement under categories A, B, and D there was no clear improvement under C. Overall the results clearly show the low score under categories C and D. This conforms some of our initial assumption that students have difficulty in integrating several key concepts to arrive at the final answer.

The difficulty factor is the ratio of students who scored the correct answer in a particular question over to the total number of students. High difficulty factor scores indicate that students have better understanding and skills for solving the problem.

2. The same set of analysis was conducted for CH102 and the results are as shown:

a. Figure 3.0. Average scores for the pre- and post test for CH102 students

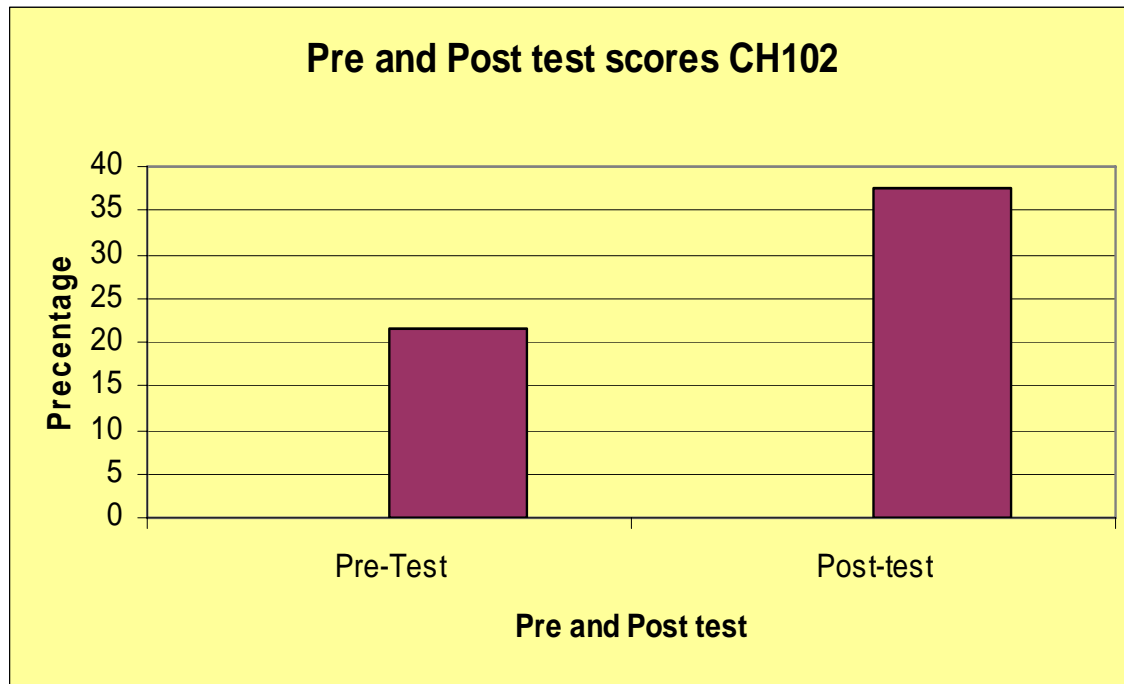
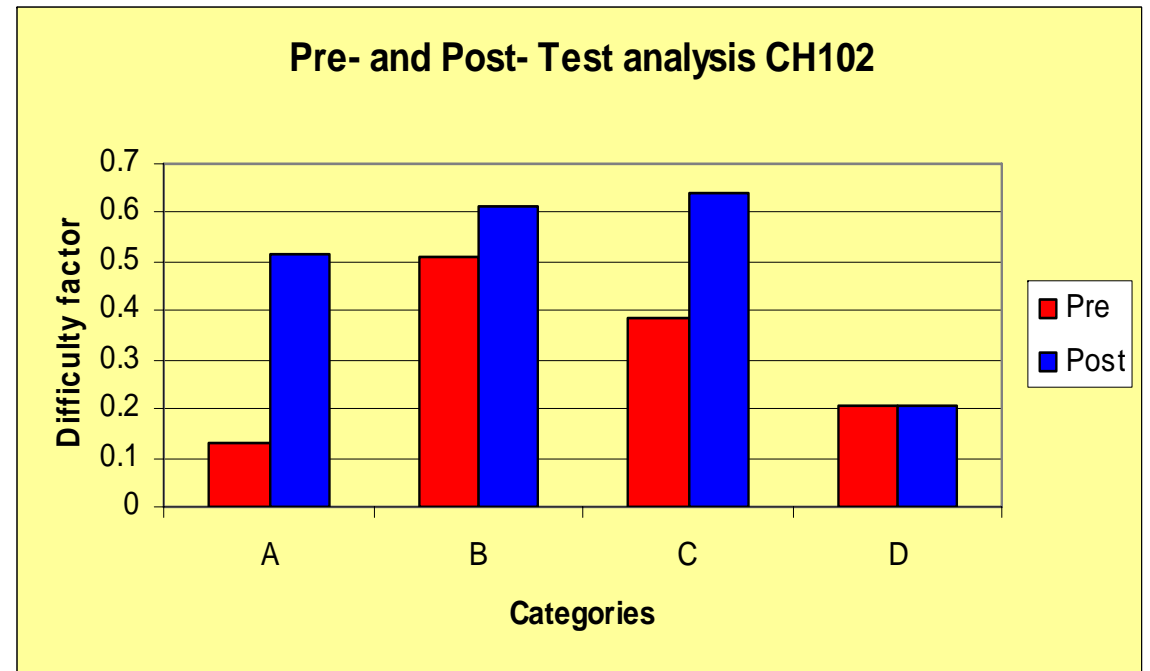


Figure 3.0 show improvement in the average scores from pre-test to post-test. However, what is obvious is the low percentage in both tests. While this datum does not present a very promising learning outcome, it provides an important lesson to the assessment approach. When these tests are not considered to be part of the student's final grade, the tendency is for students to guess or ignore the outcome. As a result, the scores show very low overall scores.

b. Figure 4.0 show the analysis of specific questions using the assessment rubrics. The plot shows remarkable improvement for category A but not as high for categories B and C. Category D show no improvement and overall score is also very low.

Figure 4.0. Pre and Post Test analysis for CH102 under the assessment rubric. Plot of difficulty factor as a function of learning categories.



3. Results from analysis of normal exam in the CH103 course also show similar trends to what is shown from the CH100 and CH102 results. The students generally have low score for category D.

In summary, the students generally score better in the post exam which does indicate the gaining of skills. However, the level of gain students may not be very conclusive due to the uncertainty in our methodology. Students also show difficulty in integrating and synthesizing information to solve problems. This could be due to several factors and the department will further look into some issues such as entry level of our students, content of our courses, and our delivery methods. However, based on these finding we are able to identify some key areas that could be improved in our courses (See Recommendation for Improvements in Section IIIA above).