



## Lander University: Unit/Program Review Report

<b>UNIT/PROGRAM NAME</b>	Chemistry
<b>OFFICE OF PRIMARY RESPONSIBILITY</b>	Department of Physical Sciences
<b>ASSESSMENT COORDINATOR</b>	Ralph Layland
<b>SUBMISSION DATE OF THIS REPORT</b>	August 28, 2009

- I. **UNIT/PROGRAM GOAL:** Develop an understanding of modern scientific concepts related to organic, inorganic, analytical and physical chemistry.

<b>Strategic Goal Supported</b>	1. Learning						
<b>Indicator of Success/ Student Learning Outcome AND Summary of Data</b>	Indicator/ Learning Outcome		AY 2004-05	AY 2005-06	AY 2006-07	AY 2007-08	AY 2008-09
	1.	Demonstrate an understanding of modern scientific concepts and issues related to organic, inorganic, analytical and physical chemistry by scoring 1 to 3 (3 being highest) on question #5 of the Seminar Rubric.	1.61 (n = 9)	2.41 (n = 4)	2.26 (n = 8)	1.87 (n = 8)	2.1 (n = 13)
	2.	Demonstrate an understanding of modern scientific concepts and issues related to organic, inorganic, analytical and physical chemistry by scoring 1 to 3 (3 being highest) on question #4 of the Research/Internship Rubric.	N/A	N/A	N/A	2.9 (n = 3)	2.35 (n = 9)
	3.	Demonstrate an understanding of modern scientific concepts and issues related to organic chemistry by their sub-score on the Major Field Test.	N/A	N/A	N/A	42 (30 <sup>th</sup> %tile)	36 (15 <sup>th</sup> %tile) (n = 12)
	4.	Demonstrate an understanding of modern scientific	N/A	N/A	N/A	48	39

		concepts and issues related to inorganic chemistry by their sub-score on the Major Field Test.				(45 <sup>th</sup> %tile)	(25 <sup>th</sup> %tile) (n = 12)
	5.	Demonstrate an understanding of modern scientific concepts and issues related to analytical chemistry by their sub-score on the Major Field Test.	N/A	N/A	N/A	48 (50 <sup>th</sup> %tile)	31 (10 <sup>th</sup> %tile) (n = 12)
	6..	Demonstrate an understanding of modern scientific concepts and issues related to physical chemistry by their sub-score on the Major Field Test.	N/A	N/A	N/A	43 (35 <sup>th</sup> %tile)	32 (10 <sup>th</sup> %tile) (n = 12)
<b>Assessment Instrument(s) and Frequency of Assessment</b>	Instrument		Frequency				
	1.	Seminar Rubric	Annually - used to evaluate student presentations in CHEM-499				
	2.	Research/Internship Rubric	Annually - used to evaluate student presentations in Research (CHEM-407, 408, 409, 410) and Internship (CHEM -490)				
	3.	Major Field Test (MFT) from ETS	Annually - Seniors in CHEM-499				
	4.	Major Field Test (MFT) from ETS	Annually - Seniors in CHEM-499				
	5.	Major Field Test (MFT) from ETS	Annually - Seniors in CHEM-499				
	6.	Major Field Test (MFT) from ETS	Annually - Seniors in CHEM-499				
<b>Expected Outcome</b>	Met (3)		Partially Met (2)		Not Met (1)		
	1.	The average score of all student scores will be between 3.0 and 2.0 indicating excellent or acceptable performance on the sub-part of the rubric addressing this Indicator of Success.	The average score of all student scores will be between 2.0 and 1.5 indicating acceptable performance on the sub-part of the rubric addressing this Indicator of Success.		The average score of all student scores will be less than 1.5 indicating unacceptable performance on the sub-part of the rubric addressing this Indicator of Success.		
	2.	Average of all student scores will be between 3.0 and 2.0 indicating excellent or acceptable performance	The average score of all student scores will be between 2.0 and 1.5 indicating acceptable performance on		The average score of all student scores will be less than 1.5 indicating unacceptable		

		on the sub-part of the rubric addressing this Indicator of Success	the sub-part of the rubric addressing this Indicator of Success.	performance on the sub-part of the rubric addressing this Indicator of Success.
	3.	The mean score of all student scores on the organic chemistry sub-section of the MFT will be above the 40 <sup>th</sup> percentile nationally on the test.	The mean score of all student scores on the organic chemistry sub-section of the MFT will be between the 20 <sup>th</sup> and the 40th percentile nationally on the test.	The mean score of all student scores on the organic chemistry sub-section of the MFT will be less than the 20th percentile nationally on the test.
	4.	The mean score of all student scores on the inorganic chemistry sub-section of the MFT will be above the 40th percentile nationally on the test.	The mean score of all student scores on the inorganic chemistry sub-section of the MFT will be between the 20th and the 40th percentile nationally on the test.	The mean score of all student scores on the inorganic chemistry sub-section of the MFT will be less than the 20th percentile nationally on the test.
	5.	The mean score of all student scores on the analytical chemistry sub-section of the MFT will be above the 40th percentile nationally on the test.	The mean score of all student scores on the analytical chemistry sub-section of the MFT will be between the 20th and the 40th percentile nationally on the test.	The mean score of all student scores on the analytical chemistry sub-section of the MFT will be less than the 20th percentile nationally on the test.
	6.	The mean score of all student scores on the physical chemistry sub-section of the MFT will be above the 40th percentile nationally on the test.	The mean score of all student scores on the physical chemistry sub-section of the MFT will be between the 20th and the 40th percentile nationally on the test.	The mean score of all student scores on the physical chemistry sub-section of the MFT will be less than the 20th percentile nationally on the test.
<b>Review of Results and Actions Taken</b>	1.	May 2009: The expected outcome was met. The average score of all student scores on question #5 of the rubric, understanding of modern scientific concepts and issues, was 2.1 for the thirteen students presenting seminars.		
	2.	May 2008: CHEM-499 last taught in Fall 2007 and the results from previous rubric reported in 2007. Data from new rubric will be acquired in Fall 2008 when course is offered again and new performance levels will be determined in Fall 2008.		
		May 2009: The expected outcome was met. The average score of all student scores on question #4 of the rubric, understanding of modern scientific concepts and issues, was 2.35 for the nine students presenting posters.		

		<p>May 2008: The expected outcome was met; however, the faculty supervising these experiential learning activities will utilize the rubric pedagogically to communicate the learning expectations to the students and we expect to see an improvement in student performance.</p>
	3.	<p>May 2009: The expected outcome was not met even though the target scores had been reevaluated and decreased after last year. A major factor for consideration is that students are not required to obtain a certain score on the MFT for graduation. As a result, some may not demonstrate their full potential. The 12 students this year scored significantly less than the students last year. The faculty will continue the analysis of these results in the fall of 2009. We recognize that we had several very strong students taking the test in 2008. The data indicate wide variation in the sub-scores for each student. We will check to see if these scores correlate to course grades in the four major topics.</p> <p>May 2008: The scores from this Spring 2008 Semester pilot assessment arrived in April 2008 and were lower than the expected outcome value. During Fall 2008 the chemistry faculty will meet to analyze the results in comparison with the fall 2007 locally-designed exit exam administered to the same group of students. This analysis may result in reevaluation of the target score to more accurately reflect the local demographics of Lander's student population. In addition, the obvious variation in our scores in the sub-categories of the MFT may lead to curriculum revision or pedagogical strategies to improve the program.</p>
	4.	<p>May 2009: The expected outcome was partially met even though the target scores had been reevaluated and decreased after last year. A major factor for consideration is that students are not required to obtain a certain score on the MFT for graduation. As a result, some may not demonstrate their full potential. The 12 students this year scored significantly less than the students last year. The faculty will continue the analysis of these results in the fall of 2009. We recognize that we had several very strong students taking the test in 2008. The data indicate wide variation in the sub-scores for each student. We will check to see if these scores correlate to course grades in the four major topics.</p> <p>May 2008: The scores from this Spring 2008 Semester pilot assessment arrived in April 2008 and were lower than the expected outcome value. During Fall 2008, the chemistry faculty will meet to analyze the results in comparison with the fall 2007 locally-designed exit exam administered to the same group of students. This analysis may result in reevaluation of the target score to more accurately reflect the local demographics of Lander's student population. In addition, the obvious variation in our scores in the sub-categories of the MFT may lead to curriculum revision or pedagogical strategies to improve the program.</p>
	5.	<p>In August of 2009 the Physical Sciences Assessment Committee analyzed the MFT results and focused on the Analytical Chemistry sub-scores. The committee plans to propose to the Physical Sciences Department that we increase the lecture contact hours in Analytical Chemistry from the current 2 hours to 3 hours in an effort to</p>

	<p>improve student outcomes in Analytical Chemistry.</p> <p>May 2009: The expected outcome was not met even though the target scores had been reevaluated and decreased after last year. A major factor for consideration is that students are not required to obtain a certain score on the MFT for graduation. As a result, some may not demonstrate their full potential. The 12 students this year scored significantly less than the students last year. The faculty will continue the analysis of these results in the fall of 2009. We recognize that we had several very strong students taking the test in 2008. The data indicate wide variation in the sub-scores for each student. We will check to see if these scores correlate to course grades in the four major topics.</p> <p>May 2008: The scores from this Spring 2008 Semester pilot assessment arrived in April 2008 met the expected outcome value. During Fall 2008, the chemistry faculty will meet to analyze the results in comparison with the fall 2007 locally-designed exit exam administered to the same group of students. This analysis may result in reevaluation of the target score to more accurately reflect the local demographics of Lander's student population. In addition, the obvious variation in our scores in the sub-categories of the MFT may lead to curriculum revision or pedagogical strategies to improve the program.</p>
6.	<p>May 2009: The expected outcome was not met even though the target scores had been reevaluated and decreased after last year. A major factor for consideration is that students are not required to obtain a certain score on the MFT for graduation. As a result, some may not demonstrate their full potential. The 12 students this year scored significantly less than the students last year. The faculty will continue the analysis of these results in the fall of 2009. We recognize that we had several very strong students taking the test in 2008. The data indicate wide variation in the sub-scores for each student. We will check to see if these scores correlate to course grades in the four major topics.</p> <p>May 2008: The scores from this Spring 2008 Semester pilot assessment arrived in April 2008 and were lower than the expected outcome value. During Fall 2008, the chemistry faculty will meet to analyze the results in comparison with the fall 2007 locally-designed exit exam administered to the same group of students. This analysis may result in reevaluation of the target score to more accurately reflect the local demographics of Lander's student population. In addition, the obvious variation in our scores in the sub-categories of the MFT may lead to curriculum revision or pedagogical strategies to improve the program.</p>
Sum	<p>In August of 2009 the Physical Sciences Assessment Committee reviewed the MFT results across all sub-scores and plans to propose to the Physical Sciences Department that we increase the 300-400 level chemistry elective requirements in the degree by 3 hours and decrease the free electives by 3 hours. We hope this change will increase student outcomes in several of the chemistry sub-disciplines assessed.</p>

		<p>In the spring of 2009 the mean scores of our students taking the Major Field Test (MFT) from ETS was lower than our expected outcomes. In August of 2009, the Physical Sciences Assessment Committee concluded that since the students are not required to obtain a certain score on the MFT for graduation, they do not take the test seriously. In October of 2009, the committee will propose to the Physical Sciences Department that we move our CHEM 499 seminar course from the fall semester to the spring semester and change it to a letter grade course rather than simply a pass/fail course. We will use the student MFT scores as a component of the grade in CHEM 499. This will allow CHEM 499 to function more effectively as a capstone experience for our chemistry majors and more accurately measure their learning outcomes.</p> <p>In the fall of 2008, The Physical Sciences Department faculty reviewed the Seminar Rubric and Research/Internship Rubric data from CHEM 407 Research and CHEM 490 Internship and decided to provide additional structure to these courses by aligning them were under the EYE Program, Lander University's experiential education program and QEP. These courses now have more explicit student learning outcomes and expectations that will be communicated to students.</p> <p>In the fall of 2007, the Physical Sciences faculty reviewed the chemistry program assessment system and revised the goals, outcomes and assessments. New rubrics based on clarified student learning outcomes were designed and this new system was implemented for data collection in the 2007-2008 academic year.</p>	
<b>Outcomes</b>		Indicator of Success Evaluation	Indicator of Success Score
	1.	Met	3
	2.	Met	3
	3.	Not Met	1
	4.	Partially Met	2
	5.	Not Met	1
6.	Not Met	1	
<b>Additional Resources Required to Achieve or Sustain Results</b>	<p>\$0.00</p> <p>Explanation</p>		

II. **UNIT/PROGRAM GOAL:** Demonstrate appropriate scientific communication skills to prepare and present a seminar presentation on a literature topic or undergraduate research experience.

<b>Strategic Goal Supported</b>	1. Learning						
<b>Indicator of Success/ Student Learning Outcome</b>	Indicator/ Learning Outcome		AY 2004-05	AY 2005-06	AY 2006-07	AY 2007-08	AY 2008-09
	1.	Demonstrate appropriate communication skills to prepare and present a seminar presentation on a literature topic by scoring 1 to 3 (3 being highest) on questions #1-#4 of the Seminar Rubric.	1.61 (n = 9)	2.41 (n = 4)	2.26 (n = 8)	1.87 (n = 8)	2.3 (n = 13)
<b>AND</b>							
<b>Summary of Data</b>	2.	Demonstrate appropriate communication skills to prepare and present a seminar presentation on an undergraduate research experience by scoring 1 to 3 (3 being highest) on questions #1-#3 of the Research/Internship Rubric.	N/A	N/A	N/A	2.67 (n = 3)	2.67 (n = 9)
<b>Assessment Instrument(s) and Frequency of Assessment</b>	Instrument		Frequency				
	1.	Seminar Rubric	Annually - in CHEM-499				
	2.	Research/Internship Rubric	Annually - used to evaluate student presentations in Research (CHEM-407, 408, 409, 410) and Internship (CHEM -490)				
<b>Expected Outcome</b>	Met (3)		Partially Met (2)		Not Met (1)		
	1.	The average score of all student scores will be between 3.0 and 2.0 indicating excellent or acceptable performance on the sub-part of the rubric addressing this Indicator of Success.	The average score of all student scores will be between 2.0 and 1.5 indicating acceptable performance on the sub-part of the rubric addressing this Indicator of Success.		The average score of all student scores will be less than 1.5 indicating unacceptable performance on the sub-part of the rubric addressing this Indicator of Success.		
	2.	The average score of all student scores will be between 3.0 and 2.0 indicating excellent or acceptable performance on the sub-part of the	The average score of all student scores will be between 2.0 and 1.5 indicating acceptable performance on the sub-part of the rubric addressing		The average score of all student scores will be less than 1.5 indicating unacceptable performance on the sub-part of		

		rubric addressing this Indicator of Success.	this Indicator of Success.	the rubric addressing this Indicator of Success.
<b>Review of Results and Actions Taken</b>	1.	<p>May 2009: The expected outcome was met for the average of four indicators on the rubric. The average score of all student scores on question #1, organization, was 2.6, on question #2, engagement, was 2.1, for question #3, verbal presentation, was 2.1, and for question #4, visual presentation, was 2.4 for the thirteen students presenting seminars. Analysis of these results will continue in the fall since this was the first year for this assessment.</p> <p>May 2008: To be determined in 2008</p>		
	2.	<p>May 2009: The expected outcome was met for the average of three indicators on the rubric. The average score of all student scores on question #1, organization, was 2.83, on question #2, engagement, was 2.74, and for question #3, visual appeal, was 2.45 for the nine students presenting posters.</p> <p>May 2008: The expected outcome was met for the average of three indicators on the rubric. The average score of all student scores on question #1, organization, was 2.8, on question #2, engagement, was 2.7, and for question #3, visual appeal, was 2.5 for the three students presenting posters. The faculty supervising these experiential learning activities will utilize the rubric pedagogically to communicate the learning expectations to the students and we expect to see an improvement in student performance.</p> <p>CHEM 499 last taught in fall 2007 and results from previous rubric reported in 2007. Data from new rubric will be acquired in fall of 2008 when the course is offered again.</p> <p>A table of historical seminar assessment data (2002-2007) is attached that relates to previous goals in use 2002-2007.</p>		
	<b>Sum</b>	<p>In the fall of 2008, The Physical Sciences Department faculty reviewed the Seminar Rubric and Research/Internship Rubric data from CHEM 407 Research and CHEM 490 Internship and decided to provide additional structure to these courses by aligning them under the EYE Program, Lander University's experiential education program and QEP. These courses now have more explicit student learning outcomes and expectations that will be communicated to students.</p> <p>In the spring of 2008, even though students met the expected outcomes on the Research Rubric, the faculty mentoring these students resolved to utilize the rubric pedagogically to communicate the learning outcomes and expectations to the students to improve performance.</p> <p>In the fall of 2007, the Physical Sciences faculty reviewed the chemistry program assessment system and revised the goals, outcomes and assessments. New rubrics based on clarified student learning outcomes were designed</p>		

		and this new system was implemented for data collection in the 2007-2008 academic year.	
<b>Outcomes</b>	Indicator of Success Evaluation		Indicator of Success Score
	1.	Met	3
	2.	Met	3
<b>Additional Resources Required to Achieve or Sustain Results</b>	\$0.00 Explanation		

III. **UNIT/PROGRAM GOAL:** Demonstrate skills necessary for safe and appropriate collection, analysis, and interpretation of data in chemistry laboratory experiments.

<b>Strategic Goal Supported</b>	1. Learning						
<b>Indicator of Success/ Student Learning Outcome AND Summary of Data</b>		Indicator/ Learning Outcome	AY 2004-05	AY 2005-06	AY 2006-07	AY 2007-08	AY 2008-09
	1.	Demonstrate skills necessary for safe and appropriate collection, analysis, and interpretation of data in chemistry laboratory experiments by their sub-score on the Major Field Test.	N/A	N/A	N/A	38 (25 <sup>th</sup> %tile) (n = 6)	28 (5 <sup>th</sup> %tile) (n=12)
	2.	Demonstrate skills necessary for safe and appropriate collection, analysis, and interpretation of data in chemistry laboratory experiments by scoring 1 to 3 (3 being highest) on questions #6-#7 on the Seminar Rubric.	N/A	N/A	N/A	N/A	2.0 (n=13)
3.	Demonstrate skills necessary for safe and appropriate collection, analysis, and interpretation of data in chemistry laboratory experiments by scoring 1 to 3 (3 being highest) on question #5-#7 on the Research/Internship Rubric.	N/A	N/A	N/A	N/A	2.6 (n=9)	

Assessment Instrument(s) and Frequency of Assessment	Instrument		Frequency	
	1.	Major Field Test (MFT) from ETS	Annually - Seniors in CHEM 499.	
	2.	Seminar Rubric	Annually - used to evaluate student presentations in CHEM 499.	
	3.	Research/Internship Rubric	Annually - used to evaluate student presentations in Research (CHEM 407, 408, 409, 410) and Internship (CHEM 490).	
Expected Outcome	Met (3)		Partially Met (2)	Not Met (1)
	1.	The mean score of all student scores on the critical thinking sub-section of the MFT will be above the 40 <sup>th</sup> percentile nationally on the test.	The mean score of all student scores on the critical thinking sub-section of the MFT will be between the 20 <sup>th</sup> and 40 <sup>th</sup> percentile nationally on the test.	The mean score of all student scores on the critical thinking sub-section of the MFT will be less than the 20 <sup>th</sup> percentile nationally on the test.
	2.	The average score of all student scores will be between 3.0 and 2.0 indicating excellent or acceptable performance on the sub-part of the rubric addressing this Indicator of Success.	The average score of all student scores will be between 2.0 and 1.5 indicating acceptable performance on the sub-part of the rubric addressing this Indicator of Success.	The average score of all student scores will be less than 1.5 indicating unacceptable performance on the sub-part of the rubric addressing this Indicator of Success.
	3.	The average score of all student scores will be between 3.0 and 2.0 indicating excellent or acceptable performance on the sub-part of the rubric addressing this Indicator of Success.	The average score of all student scores will be between 2.0 and 1.5 indicating acceptable performance on the sub-part of the rubric addressing this Indicator of Success.	The average score of all student scores will be less than 1.5 indicating unacceptable performance on the sub-part of the rubric addressing this Indicator of Success.
Review of Results and Actions Taken	1.	<p>May 2009: The expected outcome was not met even though the target scores had been reevaluated and decreased after last year. A major factor for consideration is that students are not required to obtain a certain score on the MFT for graduation. As a result, some may not demonstrate their full potential. Physical Sciences Faculty will continue the analysis in the fall by comparing the MFT results to course grades for each student in the past two years to see if trends can be verified.</p> <p>May 2008: The scores from this Spring 2008 Semester pilot assessment arrived in April 2008 and were lower than the expected outcome value. During Fall 2008, the chemistry faculty will meet to analyze the results in</p>		

		comparison with the fall 2007 locally-designed exit exam administered to the same group of students. This analysis may result in reevaluation of the target score to more accurately reflect the local demographics of Lander's student population. In addition, the obvious variation in our scores in the sub-categories of the MFT may lead to curriculum revision or pedagogical strategies to improve the program.
	2.	<p>May 2009: The expected outcome was met for the average of two indicators on the rubric. The average score of all student scores on question #6, analysis and interpretation of chemical data, was 1.9, and for question #7, depth of knowledge, was 2.1 for the thirteen students presenting seminars. Analysis of these results will continue since this was the first year for this assessment.</p> <p>May 2008: To be determined fall 2008.</p>
	3.	<p>May 2009: The average score of all student scores on question #5, analysis and interpretation of data, was 2.5 on question #6, depth of knowledge, was 2.4, and for question #7, laboratory safety, was 2.8 for the nine students presenting posters. The expected outcome was met. Analysis will continue in the fall.</p> <p>May 2008: The average score of all student scores on question #5, analysis and interpretation of data, was 2.7 on question #6, depth of knowledge, was 2.7, and for question #7, laboratory safety, was 2.0 for the three students presenting posters. The expected outcome was met. However, the faculty supervising these experiential learning activities will utilize the rubric pedagogically to communicate the learning expectations to the students and we expect to see an improvement in student performance.</p>
	Sum	<p>In the fall of 2008, The Physical Sciences Department faculty reviewed the Seminar Rubric and Research/Internship Rubric data from CHEM 407 Research and CHEM 490 Internship and decided to provide additional structure to these courses by aligning them were under the EYE Program, Lander University's experiential education program and QEP. These courses now have more explicit student learning outcomes and expectations that will be communicated to students.</p> <p>In the fall of 2008, the Physical Sciences Department examined the MFT critical thinking scores. We determined that this assessment data measured primarily quantitative reasoning. We modified prerequisites on the freshman chemistry course sequences to allow a Statistics course option. We hope this will increase student ability to analyze and interpret chemical data.</p> <p>In the fall of 2007, the Physical Sciences faculty reviewed the chemistry program assessment system and revised the goals, outcomes and assessments. New rubrics based on clarified student learning outcomes were designed and this new system was implemented for data collection in the 2007-2008 academic year.</p>
<b>Outcomes</b>	Indicator of Success Evaluation	Indicator of Success Score

	1.	Not Met	1
	2.	Met	3
	3.	Met	3
<b>Additional Resources Required to Achieve or Sustain Results</b>	\$0.00 Explanation		

#### IV. UNIT/PROGRAM SUMMARY

Unit/Program Goal	Strategic Goal Supported	Unit/Program Goal Outcome		Additional Resources Required to Achieve or Sustain Results
		Score	Evaluation Met: 3.00 – 2.01 Partially Met: 2.00 – 1.01 Not Met: 1.00 – 0.01 Not Evaluated: 0.00	
1. Develop an understanding of modern scientific concepts related to organic, inorganic, analytical and physical chemistry.	1. Learning	1.80	Partially Met	\$0.00
2. Demonstrate appropriate scientific communication skills to prepare and present a seminar presentation on a literature topic or undergraduate research experience.	1. Learning	3.00	Met	\$0.00
3. Demonstrate skills necessary for safe and appropriate collection, analysis, and interpretation of data in chemistry laboratory experiments.	1. Learning	2.33	Met	\$0.00
<b>UNIT/PROGRAM TOTALS</b>		<b>2.38</b>	<b>Met</b>	<b>\$0.00</b>