CHEMISTRY DEPARTMENT 2010 ANNUAL ASSESSMENT UPDATE

I. Mission Statement and Student Learning Outcomes

Mission Statement

The mission of the chemistry department at Westmont College is to provide a nationally competitive chemistry program that helps students become competent, thoughtful, and theologically reflective scientists, teachers, health-care providers, and citizens of our world.

Department Outcomes (Goals)

1) Our students will be prepared for professional careers in chemistry
   - as skilled entry level employees in industry.
   - as enthusiastic educators in elementary and secondary schools.
   - as competent graduate students in chemistry, biochemistry, and chemical engineering.
   -as motivated medical and dental students.

   75 % of our graduates will enter the career path of their choice as defined above.

2) Students will demonstrate a breadth and depth of knowledge in chemistry. The average performance on ACS National Exams will be at least in the 60th percentile, with 30% of the students scoring above the 80th percentile, in each course that has an exam. The average score on the Physical Science (PS) and Biological Science (BS) areas of the MCAT will be at the 60th percentile or higher.

3) Students will demonstrate a sophisticated level of laboratory skills, including experiment design and problem solving, by the time of graduation. At least 50% of our graduates will be involved in a summer research project; either at Westmont or another facility, and; at least two graduates per year will complete a major honors project

4) Our students will develop a love of learning and an enthusiasm for chemistry as a science and a discipline.

5) Our students will be experienced at reconciling Christian and secular scientific world views. They will be knowledgeable in the area of the interface between Christian Faith and science. They will have a perspective that integrates their scientific and theological beliefs into a seamless whole.

II. Follow up on Action Items Identified in previous reports.

The action items from the 2009 response to our annual report are listed below as well as the steps we have taken to address them

1) On the Chemistry Department Student Learning Outcomes:
   - Your criteria for the departmental goals are phrased in terms of questions. They should be rewritten into positive statements that communicate what students will be able to demonstrate in terms of knowledge, skills, attitudes, etc. The goals as they appear on your departmental web page are more appropriate.

- Criteria 2) and 3) for Goal I are not directly related to student outcomes and should not be included in the list of student learning outcomes. Criteria 2) and 3) are relevant to achieving your other goals and are important to the strength and vitality of the department, but their evaluation should take place as part of the six-year program review in the section on departmental capacity and resources. They should not be included in the list of student learning outcomes.

We have addressed each of these concerns in section I above. We have rewritten our criteria as statements and renamed them outcomes to reflect the change. We have also eliminated criteria 2) and 3) as requested, and reorganized our goals into five outcomes.

2) On Planning for and Reporting on Departmental Assessment:
   - Each Annual Assessment Update should include a timeline for assessment between now and your six-year Program Review. The plan should be structured so that each of your departmental objectives receives attention before the six-year Program Review Report is due. (The need for such a schedule was pointed out in the response to your six-year report.)
   - In particular, you should not be assessing and reporting on all of your objectives every year. As you correctly note in your report, the small numbers of Chemistry graduates will make yearly results from the ACS subject exams quite variable. So gather the data each year, but rotate through your student learning outcomes discussing and reporting on the accumulated data for each one about once every three years.

Our proposed schedule is as follows:
2010 – Focus on outcome 5)
2011 – Focus on outcome 1)
2012 – Focus on outcome 2)
2013 – Focus on outcome 3) and 4)

- When reporting on data gleaned from essays, include the prompt and the evaluation rubric as appendices. In the body of the report, identify the number of essays involved and the number of essays that were judged according to the rubric to fall into the various proficiency levels.
- When using student participation as a measure of engagement, report the numbers or percentages of students participating.

We have addressed these concerns in section III below.

III. 2010 Focus

A) Our 2010 focus is outcome 5) which reads: Our students will be experienced at reconciling Christian and secular scientific world views. They will be knowledgeable in the area of the interface between Christian Faith and science. They will have a perspective that integrates their scientific and theological beliefs into a seamless whole. We have assessed this outcome by having our students who are enrolled in CHM 195 (chemistry seminar) write on the following prompt: *Describe the relationship between your work as a scientist and your life as a Christian.* Ten student essays were evaluated. The graded essays are stored in the chemistry department assessment archive under Assessment Data\2010 Student Essays. The rubric used to grade the essays by two departmental readers (A and B) is shown below.

	Poor (2 pts)	**Satisfactory** (5 pts)	**Excellent** (8 pts)	**Outstanding** (10 pts)
Overall Writing Quality (Is the response well-written?)	Jumbled, wordy. Many grammatical errors.	Wordy, but not jumbled. Few grammatical errors	Coherent, concise. No grammatical errors.	Clear, concise, beautifully written. No grammatical errors.
Main Thesis (Does the response have a central clear idea about how the student's work as a scientist and his or her life as a Christian integrate with or relate to one another?)	No main thesis.	Contains a main idea, but main idea is weak.	Cogent, clearly stated thesis.	Strong, clearly stated, thesis.
Support and Focus (Does the body of the paper support the main idea or does it wander into irrelevant material?)	Body does not support the main idea.	Body moderately supports the main idea, but contains extraneous material.	Body supports main idea.	Body clearly and convincingly supports the main idea.
Maturity and Depth of Thought (Is the student's thinking at a mature level? Have they thought deeply about how these two parts of their lives fit integrate into a seamless whole>)	Ideas are immature and characteristic of those who have not thought deeply about the topic.	Ideas are okay and show some prolonged engagement with the topic.	Ideas are strong and show prolonged engagement with the topic.	Ideas are mature and well developed. The student has clearly thought about this a great deal.
	8 points total	**20 points total**	**32 points total**	**40 points total**

Out of 10 papers, the average grade is 27.7 points, which is between Satisfactory and Excellent. The range is from 21-34 pts.

B) The department discussed the results of the student essays at our department meeting on September 7, 2010. We decided that, although the average of the essay scores was clearly above the satisfactory level, we would like a bit more from our students. We set a score of 32 (excellent) as our goal. The assessment method was deemed satisfactory.

C) We felt that students could perform better with respect to our assessment rubric if the expectations for the essays had been more clearly explained to them. In order to meet our revised goal, we decided that students should have two or three opportunities throughout the

chemistry seminar course (CHM 195) to write essays of the type used at the end of the semester for assessment. In particular, students should be given the rubric at the beginning of the semester, and these essays should be graded according to the rubric so that students get a better sense of the expectations.

IV. Next Steps

A) Next year, we will focus on outcome 1. In our meetings, we continue to track our graduates and their current careers in order to assess outcome 1.

B) In 2012, will focus on outcome 2. To that end, we continue to administer and track the results of the American Chemical Society subject exam and of our student's MCAT scores. The current data is included in appendix A).

C) In order to prepare for a more careful evaluation of our summer research program, we have added an appendix (appendix B) that lists those students involved in summer research. In addition, we have prepared a questionnaire to be administered to our summer research students at the end of their summer research experience. We will administer that questionnaire for the first time to those students who participated in summer research during the summer of 2010.

Appendices:

A) ACS Exam Results and MCAT Data
B) Summer Research Students

Appendix A

Data for Outcome 2: Chemical Knowledge

American Chemical Society National Subject Exams

We continue to track our student's chemical knowledge through the administration of the national American Chemical Society subject exams. The results from the last three years are shown below.

	American Chemical Society National Exam Results						
	Percentiles based on National Norms						
Spring 10	**Course Number**	**Number of Students**	**%Tile**	**Std. Dev.**	**Range**	**Above 80%tile**	**Percent above 80%tile**
Gen. Chem.	6 Honors	20	**79**	19	25-100	13	65%
	6A&B	68	**42**	25.4	0-94	4	10%
Gen Chem	Combined	88	50.4	23.9	0-100	17	19.3%
Organic	102	48	**49**	27	1-100	8	17%
Analytical	121	16	**79**	23	26-100	7	44%
P.Chem.II	131	2	**60**	3		0	0%

	American Chemical Society National Exam Results						
	Percentiles based on National Norms						
Spring 09	**Course Number**	**Number of Students**	**%Tile**	**Std. Dev.**	**Range**	**Above 80%tile**	**Percent above 80%tile**
Gen. Chem.	6 Honors	15	**73**	25	27-98	8	53%
	6A&B	70	**49**	10	1-100	11	16%
Gen Chem	Combined	85	**53.2**	12.6	1-100	19	22%
Organic	102	36	**63**	24	6-99	9	25%
Analytical	121	13	**85**	23	22-100	10	77%
P.Chem.II	131	4	**66**	8.6	58-78	0	0%
Inorganic	104	9	83	24	36-99	4	44

	American Chemical Society National Exam Results						
	Percentiles based on National Norms						
Spring 08	**Course Number**	**Number of Students**	**%Tile**	**Std. Dev.**	**Range**	**Above 80%tile**	**Percent above 80%tile**
Gen. Chem.	6 Honors	33	**85**	14	48-100	23	70%
	6A&B	49	**50**	26	3-99	8	16%
Gen Chem	Combined	82	**64.1**	21.2	3-100	31	38%
Organic	102	31	**64**	23	31-98	9	29%
Analytical	121	17	**64**	24	9-96	7	41%
P.Chem.II	131	5	**45**	6	42-59	0	0%

	American Chemical Society National Exam Results						
	Percentiles based on National Norms						
Spring 07	**Course Number**	**Number of Students**	**%Tile**	**Std. Dev.**	**Range**	**Above 80%tile**	**Percent above 80%tile**
Gen. Chem.	6 Honors	22	**79**	19.3	45-99	14	63%
	6A&B	58	**63**	26	10-98	22	37%
Gen Chem	Combined	80	**67.3**	26	10-99	36	45%
Organic	102	43	**43.2**	24	1-87	3	7%
Inorganic	104	8	**47**	31	7-93	1	12%
Analytical	121	9	**77**	19	41-98	5	55%
P.Chem.II	131	2	**76**	-	57-94	1	50%

Medical College Accept Tests (MCAT)

The MCAT data for our graduates last year is shown below
MCAT Data

MCAT Exam Results: 01-Jul-2009 through 30-Jun-2010

Westmont												
	N=24											
			Percentage of Students with Scores									
MCAT Section	**Mean**	**Std Dev**	**1-4**	**5-6**	**7**	**8**	**9**	**10-11**	**12-15**			
Verbal Reasoning	9.5	1.68	0	4	17	4	13	58	4			
Physical Sciences	10.4	1.89	0	4	0	13	8	46	29			
Biological Sciences	10.4	1.78	0	0	4	17	8	46	25			
MCAT Section	**Median**	**25th / 75th %ile**	**J-K**	**L-M**	**N**	**O**	**P**	**Q-R**	**S-T**			
Writing Sample	P	M / Q	4	29	4	4	21	38	0			
MCAT Section	**Mean**	**Std Dev**	**3-7**	**8-12**	**13-17**	**18-22**	**23-25**	**26-28**	**29-31**	**32-35**	**36-40**	**41-45**
Total	30.3P	4.44	0	0	0	4	13	13	21	38	13	0

National												
	N=82848											
			Percentage of Students with Scores									
MCAT Section	**Mean**	**Std Dev**	**1-4**	**5-6**	**7**	**8**	**9**	**10-11**	**12-15**			
Verbal Reasoning	8.0	2.48	9	20	10	14	15	27	4			
Physical Sciences	8.3	2.48	5	19	19	14	12	21	11			
Biological Sciences	8.8	2.53	7	12	7	15	15	33	11			
MCAT Section	**Median**	**25th / 75th %ile**	**J-K**	**L-M**	**N**	**O**	**P**	**Q-R**	**S-T**			
Writing Sample	O	M / Q	4	27	9	13	10	33	5			
MCAT Section	**Mean**	**Std Dev**	**3-7**	**8-12**	**13-17**	**18-22**	**23-25**	**26-28**	**29-31**	**32-35**	**36-40**	**41-45**
Total	25.1O	6.43	0	3	9	19	19	18	15	12	4	0

Percentiles 7/09-6/10

Count	verbal	Physical Sci.	Writing Sample	Biological Sci.	Total
24	67.4	68.1	49.6	65.7	69.8

MCAT Exam Results: 01-Jul-2008 through 30-Jun-2009

Westmont											
Group		**N=**									
Examinees - All		28									
			Percentage of Students with Scores								
MCAT Section	**Mean**	**Std Dev**	**1-4**	**5-6**	**7**	**8**	**9**	**10-11**	**12-15**		
Verbal Reasoning	9.4	2.02	4	7	0	18	11	57	4		
Physical Sciences	8.7	1.98	0	7	29	18	11	25	11		
Biological Sciences	9.5	2.21	4	4	7	7	25	39	14		
MCAT Section	**Median**	**25th / 75th %ile**	**J-K**	**L-M**	**N**	**O**	**P**	**Q-R**	**S-T**		
Writing Sample	P/Q	M / Q	0	32	7	7	4	46	4		
MCAT Section	**Mean**	**Std Dev**	**3-7**	**8-12**	**13-17**	**18-22**	**23-25**	**26-28**	**29-31**	**32-35**	**36-40**	**41-45**
Total	**27.6P/Q**	**5.09**	**0**	**0**	**4**	**11**	**18**	**29**	**21**	**11**	**7**	**0**

National											
Group		**N=**									
Examinees - All		79088									
			Percentage of Students with Scores								
MCAT Section	**Mean**	**Std Dev**	**1-4**	**5-6**	**7**	**8**	**9**	**10-11**	**12-15**		
Verbal Reasoning	8.0	2.47	10	19	10	16	16	26	4		
Physical Sciences	8.2	2.44	5	19	18	14	13	20	10		
Biological Sciences	8.7	2.54	7	12	7	16	16	32	11		
MCAT Section	**Median**	**25th / 75th %ile**	**J-K**	**L-M**	**N**	**O**	**P**	**Q-R**	**S-T**		
Writing Sample	O	M / Q	3	28	9	13	10	31	6		
MCAT Section	**Mean**	**Std Dev**	**3-7**	**8-12**	**13-17**	**18-22**	**23-25**	**26-28**	**29-31**	**32-35**	**36-40**	**41-45**
Total	24.9O	6.42	0	3	9	20	18	18	16	11	4	0

Percentiles 7/08-6/09

Count	verbal	Physical Sci.	Writing Sample	Biological Sci.	Total
28	64.8	56.2	56.1	56.8	60.0

Appendix B

SUMMER RESEARCH STUDENTS

2004	Currently
1	St. Louis U. - medicine
2	RN/BSN 2007
3	Grad School UCSB (Chem)
4	Teacher
5	UCSB teaching credential
6	Instructor –Westmont Chemistry Dept.
2005	
1	Grad School UCRiverside (Chem)
2	Grad School Michigan St. U. (Chem)
3	M. D.- Loma Linda grad. 2010
4	Grad School Portland St. (Psych)
5	Grad School Hawaii (Chem)
6	Teacher
2006	
1	Grad School UC Davis (Chem)
2	Forensic Chemist, Oregon Crime Lab
3	Grad School Michigan St. U.
2007	
1	Midwestern AZ – Med School/DO
2	Georgetown U. – Med School
3	Applying to Grad School; working in a lab in SB
4	Applying to Medical School
5	Stanford Medical School
2008	
1	Applying to Med School
2	Applying to Med School
3	Working in Analytical Lab/Applying to Grad School
4	Senior at Westmont College
5	Grad School Univer. Michigan (Chem)
6	MPH online program/Applying to Med School
7	Grad School UCSB (Chem)
8	High School Chemistry teacher
9	Grad School Baylor University (Chem)
2010	
1	Sr. Westmont – Applying to Med School
2	Sr. Westmont – Applying to Grad School (neuroscience)
3	Jr. Westmont College
4	Jr. Westmont College
5	Sophomore Westmont College
6	Jr. Westmont College
7	Sr. Westmont – plans to be a missionary Pakistan
8	Sr. Westmont – Applying to Med School
9	Sr. Westmont – Applying to Med School
10	Jr. Westmont College