MARYMOUNT UNIVERSITY
Arlington, Virginia

STUDENT LEARNING ASSESSMENT REPORT

PROGRAM: Biochemistry
SUBMITTED BY: Laura Medhurst
DATE: 9/30/2017
BRIEFLY DESCRIBE WHERE AND HOW ARE DATA AND DOCUMENTS USED TO GENERATE THIS REPORT BEING STORED: The DAT assessment data, and the results for the exit exam for the Biochemistry majors is stored on the laptop of Dr. Laura Medhurst in Caruthers 3010 and also on the Biology and Physical Sciences Assessment Google site. The graduating student survey results are maintained by the PIE office.

EXECUTIVE SUMMARY

Program description from the Course Catalog: Please copy and paste the current year's catalog description of this program. This is generally a one-two paragraph description immediately following the name of the program. Please be sure to include the listing of program outcomes as printed.

Biochemistry (B.S.)
Biochemistry is the study of biological molecules and chemical processes that make up all living systems, which in turn relates to the study and understanding of whole organisms. To fully interact with known biochemical information and make future contributions to our molecular understanding of life, students must obtain a broad background in biology and a firm foundation in chemistry, mathematics, and physics.
The program prepares students for professional school (medicine, dentistry, or veterinary medicine) and graduate school in biochemistry, molecular biology, or another biological science discipline. Graduates will find employment opportunities in the research programs of universities or industrial and government laboratories.

List all of the program's learning outcomes: *(regardless of whether or not they are being assessed this year)*

Learning Outcome	Year of Last Assessment	Assessed This Year	Year of Next Planned Assessment
comprehend the breadth of current concepts in biochemistry and molecular genetics			
read and critically evaluate scientific literature	2016	xx	2018
formulate hypotheses and develop, conduct, and interpret a research plan			2018
demonstrate the ability to apply knowledge gained		xx	

Describe how the program's outcomes support Marymount's mission, strategic plan, and relevant school plan:

The Biochemistry program was recently developed to expand the major offerings in the natural sciences, and was included in the Arts and Sciences strategic plan as a major, which would promote gender balance. It is designed to be a rigorous undergraduate academic program, which supports the mission of the university by preparing students for careers in the lab science, for graduate programs in biochemistry, and professional programs in health sciences such as medical school, dental school, and pharmacy school. (Strategic Plan Goal: Offer rigorous, cohesive, integrated undergraduate and graduate curricula that produce superior graduates able to succeed in their positions and communities.) The program begins with foundational courses in biology and chemistry, which are also components of the biology major.

These shared courses also include BIO 300, Writing for Science, and BIO 410, Senior Seminar, which improve the students technical writing and presentation skills, introduce them to the current scientific literature, and emphasize ethics in science. The program culminates in advanced biochemistry lecture and laboratory and physical biochemistry. These courses are designed to introduce students to recent advances in the theory and practice of biochemistry and to stimulate their intellectual curiosity. In these courses they will hone their skills as scientific researchers. Finally in their senior year, students are required to have an internship experience to apply their learning.

Provide a brief description of the assessment process used including strengths, challenges and planned improvements and provide evidence of the existence of a culture of continuous improvement based on assessment:

The assessment process of the biochemistry programs has developed from the assessment process of the biology (BS) program and is using instruments developed by that program. A major strength of both programs is the level of communication between all the faculty. This results in an excellent "informal" assessment of student achievement, when faculty in upper division courses communicate to faculty at the lower division level which concepts the students grasp and which are need more attention, and then faculty in the earlier course adapt their content and/or delivery to address those needs. A challenge is to find a method to "formalize" this using the assessment process. The biology program has used the DAT rubric in several courses throughout the curriculum to track the students' progress. With the advent this year of the Biology (BA) program and the need to separately evaluate all three major programs, several improvements will need to be implemented to make this possible. The first and more important planned improvement is a modification of the senior exit exam. Each program has different curriculum and they can no longer use the same exam. This new exam will be given in spring 2018. A second needed improvement is a better system for organizing the assessment data and to have it available for everyone, who needs to see it. This improvement has begun with the advent of a shared google site for assessment data.

Describe how the program implemented its planned improvements from last year:

Outcome	**Planned Improvement**	**Update** *(Indicate when, where, and how planned improvement was completed. If planned improvement was not completed, please provide explanation.)*
Demonstrate foundational knowledge in biology and chemistry.	At this time, the planned curricular and program improvements are in the advanced course work and laboratory experiences. There are no planned improvements in the foundational courses.	
Critically evaluate and interpret scientific literature in a professional setting.	Curricular improvements are planned for the course CHM 441 Physical Biochemistry. Activities and assignments, which require reading and interpreting results from the primary, peer reviewed literature will be added to the curriculum.	Some curricular improvements were made in the course CHM 441.

MARYMOUNT UNIVERSITY
Arlington, Virginia

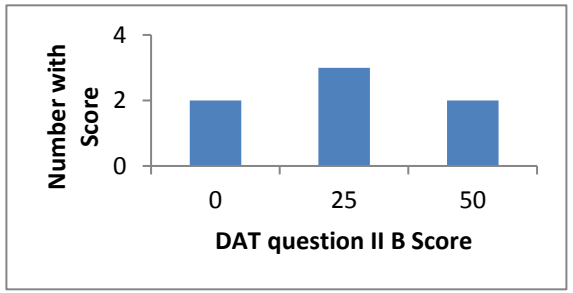
Provide a response to last year's University Assessment Committee review of the program's learning assessment report:

The assessment committee requested that the learning outcomes be modified, and in this assessment report the learning outcomes are the same that are listed in the catalogue. The program will reexamine the outcomes before the next deadline for catalogue revisions.

Outcomes Assessment 2016-2017

Learning Outcome 1: read and critically evaluate scientific literature

Assessment Activity

Outcome Measures *Explain how student learning will be measured and indicate whether it is direct or indirect.*	**Performance Standard** *Define and explain acceptable level of student performance.*	**Data Collection** *Discuss the data collected and student population*	**Analysis** *1) Describe the analysis process.* *2) Present the findings of the analysis including the numbers participating and deemed acceptable.*
The student learning is measured in Senior Seminar, BIO 410. In this course students research a current topic in biology or biochemistry and give a one hour presentation. These presentations are evaluated by the instructor using the DAT assessment tool. The section information seeking, selecting and evaluating is used. (See appendix 1 for the DAT assessment tool and appendix 2 for a description of BIO 410.) This is a direct measurement.	An acceptable level of student performance is a DAT score of 4.0 or greater, which is defined as "Evaluates information and its sources based on a wide variety of relevant criteria as they relate to a discipline."	The DAT scores were recorded for all students during/after their presentation. The data used here are from three separate sections of BIO 410, two in SP 2017 and one in FA 2016. This sample included 11 of the 12 graduates for 2017, and they were evaluated either in their junior or senior year.	The scores for the DAT were entered into an EXCEL spreadsheet and the average and standard deviations were calculated for the 11 students. The average was 4.45 with a standard deviation of 0.69. 6 students were rated 5, 4 at 4 and 1 at 3. Therefore 10 of the 11 students, or 90.9% in this sample had an acceptable level of performance, and one did not. 
The student learning will also be measured by their answers to the questions on the Graduating Student Survey, the GSS, in the section Evaluation of Preparation:	An acceptable level of student performance is for each student to be "good or excellent" or for the average response to be greater than 4 on the numeric scale.	The GSS is collected and analyzed by PIE. 12 Students completed the survey.	The results were analyzed by PIE. Of the twelve students who participated in the survey, 83.3% rated their preparation as good or excellent, and the mean score was 4.33 with a standard deviation of 0.78 for both survey questions. This means that 10 of the 12 students met the acceptable performance level, and 2 did not.

Outcome Measures *Explain how student learning will be measured and indicate whether it is direct or indirect.*	**Performance Standard** *Define and explain acceptable level of student performance.*	**Data Collection** *Discuss the data collected and student population*	**Analysis** *1) Describe the analysis process. 2) Present the findings of the analysis including the numbers participating and deemed acceptable.*
"Find appropriate sources of information" and "Evaluate the quality of information"			

Interpretation of Results

Extent this learning outcome has been achieved by students *(Use both direct and indirect measure results)***:**

The two measures agree on the extent that this learning outcome was achieved. The instructor evaluation and the self- evaluation of the students concur that the vast majority, greater than 83% of the students achieved this learning outcome.

Program strengths and opportunities for improvement relative to assessment of outcome:

The majority of graduates are achieving this outcome. Therefore the program is giving the students most of skills necessary to understand the primary literature in the science and to assess the quality of a particular source. Unfortunately a small number of students are graduating with this skill less developed than it should be.

Discuss planned curricular or program improvements for this year based on assessment of outcome:

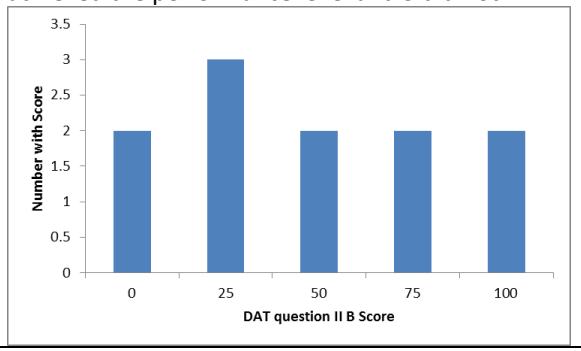
More improvements will be made in CHM 441 to include more interpretation of research papers.

Learning Outcome 2: demonstrate the ability to apply knowledge gained

Assessment Activity

Outcome Measures *Explain how student learning will be measured and indicate whether it is direct or indirect.*	**Performance Standard** *Define and explain acceptable level of student performance.*	**Data Collection** *Discuss the data collected and student population*	**Analysis** *1) Describe the analysis process. 2) Present the findings of the analysis including the numbers participating and deemed acceptable.*
This learning outcome will be measured by the results from the exit exam research	Participating students will achieve an average score of 50% or more correct of the available points on the	The exit exam is a comprehensive multiple choice exam written by Marymount University faculty.	1) The Office of Planning and Institutional Effectiveness tabulated the data analysis for the exit exam. A Biology and Physical Sciences faculty member analyzed the data. The average percent of correctly answered Research

MARYMOUNT UNIVERSITY
Arlington, Virginia

Outcome Measures *Explain how student learning will be measured and indicate whether it is direct or indirect.*	**Performance Standard** *Define and explain acceptable level of student performance.*	**Data Collection** *Discuss the data collected and student population*	**Analysis** *1) Describe the analysis process. 2) Present the findings of the analysis including the numbers participating and deemed acceptable.*
interpretation section of the senior exit exam. This is a direct measurement.	research interpretation section of the Exit Exam.	The exit exam is administered as an on-line survey by the Office of Planning and Institutional Effectiveness with the help of a Biology and Physical Sciences Department faculty in mid-April. The score is reported as percent correct for specific sections of the exam. Please see Appendix 3 for the Exit Exam questions and the figure. and Appendix 4 for the Exit Exam Instructions and Introductory Script.	Reading questions was used to assess if the students met the acceptable level of performance. 2) Of the 11 students for whom there is exit exam data, 6 achieved the performance level and 5 did not. 
Two questions from the GSS are used to assess this outcome. "Apply knowledge and skills in new situations" and "Solve problems in your field using your knowledge and skills" This is an indirect measurement.	An acceptable level of student performance is for each student to be "good or excellent" or for the average response to be greater than 4 on the numeric scale.	The GSS is collected and analyzed by PIE. 12 Students completed the survey.	The results were analyzed by PIE. Of the twelve students who participated in the survey, 66.7% rated their preparation as good or excellent, and the mean score was 3.92 with a standard deviation of 1.00 for both survey questions. This means that 8 of the 12 students met the acceptable performance level, and 4 did not.

Interpretation of Results

Extent this learning outcome has been achieved by students *(Use both direct and indirect measure results)***:**

Although the agreement between the indirect and direct measurements is not as strong as for the previous outcome, they do agree within one standard derivation. This outcome has been achieved by greater than half of the graduating students.

Program strengths and opportunities for improvement <u>relative to assessment of outcome</u>:

Clearly there is room for improvement in this outcome. If we compare the results of this year to the previous year, there has already been improvement in this outcome. (See appendix 5 for a comparison of exit exam scores for 2016 and 2017 for each section of the exit exam.) The low numbers of the previous year, however, make this a very tentative result.

Discuss planned curricular or program improvements <u>for this year based on assessment of outcome:</u>

More activities in upper division coursework for integration of learning from a variety of previous course will be developed and implemented.

MARYMOUNT UNIVERSITY
Arlington, Virginia

Curriculum Map

These will be sent for review and feedback to the Liberal Arts Core Committee.

UNDERGRADUATE CURRICULUM MAP

Degree Program: Biochemistry (BS)
Year: 2016-2017

Program Outcomes:

Program Outcome	Critical Thinking	Inquiry	Information Literacy	Written Communication
comprehend the breadth of current concepts in biochemistry and molecular genetics	X			
read and critically evaluate scientific literature		X	X	X
formulate hypotheses and develop, conduct, and interpret a research plan		X		X
demonstrate the ability to apply knowledge gained	X			

Curriculum Map:
For each course, indicate which competencies are included using the following key. Please refer to the director of assessment in Planning and Institutional Effectiveness if you need more detailed explanation of the four core competencies.

Level of instruction: I – Introduced, R-reinforced and opportunity to practice, M-mastery at the senior or exit level
Assessment: PR-project, P-paper, E-exam, O-oral presentation, I-internship, OT-other (explain briefly)

Curriculum Map: for core competencies (critical thinking, inquiry, informational literacy, written communication).
(Reviewed and updated in January and April, 2017 from the 2015-2016Learning Assessment Report.)

For each course, indicate which competencies are included using the following key. Please refer to the director of assessment in Planning and Institutional Effectiveness if you need more detailed explanation of the four core competencies.
Level of instruction: I – Introduced, R-reinforced and opportunity to practice, M-mastery at the senior or exit level
Assessment: PR-project, P-paper, E-exam, O-oral presentation, I-internship, OT-other (explain briefly)
KEY:
For each course, indicate which competencies apply.
Level of instruction: I – Introduced, R-reinforced and opportunity to practice, M-mastery at the senior or exit level
How Assessed: A – Assessment, P-paper, E-exam, O-oral presentation, I-internship, OT-Other (explain briefly), LE-Laboratory Exercise, INQ-Inquiry Based Project

Required Course	Critical Thinking		Inquiry		Information Literacy		Written Communication	
	Level	Assess	Level	Assess	Level	Assess	Level	Assess
Bio151/151L	I	E, P	I	P, LE	I	A	I	P
Bio152/152L	I	E, P, LE	I	OT-literacy assignment	I	OT-literacy assignment	I	OT- literacy assignment
Bio260/260L	R	E, LE	R	O, LE	R			
Bio262/262L	R	E, LE	R	LE	R	OT-literacy assignment		
Bio300	R	A, P, INQ	R	INQ	R	P, INQ	R	P
Bio363	R	E, P,O, INQ	R	INQ	R	P, O, INQ	R	P, E, O, INQ
Bio368	R	P, E, O, OT (lab notebook), LE, INQ	R	LE, INQ, P, O	R	P, O, LE, INQ	R	P, E, LE, INQ
Bio400	M	I	M	I	M	I	M	I
Bio410	R	O, OT-class discussions and readings	M	O, OT-class discussions and readings	M	OT-class discussions and readings	M	OT-class discussions and readings
Bio441/441	M	LE, P, O, E	M	LE, INQ	M	INQ, P	M	O, P
Bio442	M	E, INQ	M	INQ	M	INQ, P	M	P
Bio449	M	LE, E	M	INQ, LE, P	M	INQ, P, O	M	P, O

CHM151/151L	I	E, INQ, LE	I	E, INQ, LE	I	INQ	I	INQ, LE
CHM152/152L	R	E, INQ, LE	R	E, INQ, LE	R	INQ	R	INQ, LE
CHM221/221L	R	E, INQ, LE	R	E, INQ, LE	R	INQ	R	INQ, LE
CHM441	M	E	M	E, OT-class assignments	M	OT-class assignment		
MA 218	R	E, OT-class assignments and discussion					R	E, OT- class assignments and discussion
PHYS271/271L	R	E, INQ, LE	R	E, LE	R	OT - citizen science	R	O, LE
PHYS272/272L	R	E, INQ, LE	R	E, LE	R	OT - citizen science	R	O, LE