STUDENT LEARNING ASSESSMENT REPORT

PROGRAM: Biology, B.S,
SUBMITTED BY: Barbara Kreutzer
DATE: October , 2017
BRIEFLY DESCRIBE WHERE AND HOW ARE DATA AND DOCUMENTS USED TO GENERATE THIS REPORT BEING STORED:

THE DATA FOR THE EXIT EXAM, DAT RUBRICS, ARE IN A GOOGLE DOCUMENT AT THE FOLLOWING LINK, (MASKED)

HARDCOPIES OF THE DAT RUBRICS ARE IN THE LABELED DRAWERS IN CARUTHERS 3005. THE LAB SAFETY RECORDS ARE KEPT IN THE DEPARTMENT LAB COORDINATOR'S OFFICE, CARUTHERS 3023.THE DATA FOR THE ALUMNI SURVEYS ARE IN CANVAS/COURSES/BIOLOGY AND PHYSICAL SCIENCES/FILES/ASSESSMENT/ALUMNI SURVEYS AND MAY ALSO BE OBTAINED FROM THE OFFICE OF PLANNING AND INSTITUTIONAL EFFECTIVENESS. THE DATA FOR THE INTERNSHIPS ARE IN THE CANVAS/COURSES/BIOLOGY AND PHYSICAL SCIENCES/FILES/ INTERNSHIP SURVEYS AND MAY ALSO BE OBTAINED FROM THE OFFICE OF CAREER SERVICES.

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.

Biology (B.S.)
Study in the biological sciences responds to the increasing demand for scientific expertise in a variety of professional settings, including industry and law.
The program permits students to build on a common foundation of introductory courses in biology and chemistry. It provides preparation for advanced studies in biology and health-related professional fields, or for entry into a variety of areas within the biotechnology industries.
Upon successful completion of the biology program, students will be able to

- apply gained knowledge and experience to a complex, current scientific problem;
- demonstrate the ability to apply knowledge gained from the major in a professional setting;
- demonstrate an understanding of and competency in basic scientific skills such as observing safe laboratory practices and making solutions;
- formulate hypotheses, design a project, and gather and analyze data to address scientific questions;
- display an understanding of ethical dilemmas and social issues and apply their understanding to situations in professional settings; and
- demonstrate scientific literacy by communicating synthesis of knowledge and critical analysis of read scientific information

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

Learning Outcome Upon successful completion of the biology program, students will be able to …	Year of Last Assessment	Assessed This Year	Year of Next Planned Assessment
• apply gained knowledge and experience to a complex, current scientific problem;	2013-2014	Yes	2018-19
• demonstrate the ability to apply knowledge gained from the major in a professional setting;	2013-2014	Yes	2018-19
• demonstrate an understanding of and competency in basic scientific skills such as observing safe laboratory practices and making solutions;	2013-2014	Yes	2018-19
• formulate hypotheses, design a project, and gather and analyze data to address scientific questions;	2015-2016	No	2017-18
• display an understanding of ethical dilemmas and social issues and apply their understanding to situations in professional settings; and	2015-2016	No	2017-18
• demonstrate scientific literacy by communicating synthesis of knowledge and critical analysis of read scientific information	2015-2016	No	2017-18

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

Our program has a strong commitment to Academic Excellence, as well as to promote career preparation within a liberal arts framework. Through the process of building a solid foundation of knowledge in the current field of biology, developing the student's ability to interpret primary research, and providing opportunities to hone their ability to apply what they have learned in a professional setting, we give them not only an excellent education but also the tools to become effective adult learners. The content of our introductory through advanced science courses provide the foundational knowledge and spark their interest in general biology, chemistry, physics, genetics, microbiology, botany, parasitology, endocrinology, immunology, virology, biochemistry, and environmental topics. These courses frequently contain modules which focus on ethical and social issues and were modified two years ago to meet new university and core learning requirements. The labs accompanying our introductory biology, chemistry and physics courses and our lab-based courses, Bio 368 Advanced Lab Research Methods and Bio 369 Advanced Molecular Biology, give the students a strong background in laboratory techniques and are a natural inquiry based learning tool. Students report back to us that they found these courses extremely helpful in internships, graduate research and entry-level jobs after graduation. Lab courses accompany many of our lecture courses and provide many active learning modules. Our required departmental internship is a cap-stone experience which allows the students to apply their knowledge in professional settings and provides a stepping-stone to jobs after graduation. Many of the projects in our introductory through advanced level courses require interpretation of primary research, group work and classroom presentations. Our departmental writing intensive course, Bio 300, hones the students' technical writing skills.

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:

Brief description of the assessment process used including strengths, challenges and planned improvement

As direct and indirect measures of our student learning objectives, we use rubric and information from courses as our majors move through the program, selected questions from a senior exit exam, internship evaluations, and alumni and graduating senior surveys. Some of the courses used are BIO 151-152 General Biology for Majors, BIO 300 Writing for Science, and BIO 410 Senior Seminar. We have several strong indirect measures, including selected questions from internship evaluations, the Graduating Senior Survey (GSS) and the University and Biology Department Alumni Surveys. Our direct measures include rubrics and required products from courses such as BIO 151-152, BIO 300 and BIO 410 and results from our exit exam. To validate and expand the direct measures, we use rubrics which incorporate a range of defined performance standards, such as very positive, positive, somewhat positive, mainly negative and mostly negative. In order to provide deeper insight

into which aspects of the program could be changed to promote improved learning, we applying rubrics to selected products in key classes at the first, second, third, and fourth year to assess student learning as our majors move through the program.

Evidence of the existence of a culture of continuous improvement based on assessment:
To promote a culture of continuous improvement based on assessment, we discuss assessed learning outcome results presented in the student learning assessment report and develop a consensus and action plan to address any issues. When measure results continue below the performance standards or indicate problems in other ways, we make changes in our curricula to address the issue and improve student performance. The data, results, and reports are posted in platforms easily accessible to all our faculty. The current platform is the department faculty Canvas site (available upon request). Also, after a few cycles of strong learning outcome measure results which are well above the performance standard, we develop and assess new learning objectives. When measure results continue below the performance standards or issues are indicated in other ways, we make changes to our curricula to address the issues. Examples which ushered in significant changes in our program, include the development and offering of the Biochemistry, B. S degree, and botany, immunology, and neurobiology courses and also the incorporation of well-developed rubrics in project evaluations. All of these were developed as the result of comments in student GSS and alumni surveys and comments by the UAC. An another example of responses to declines in learning objective results include the incorporation throughout the curriculum of ethics and social issue modules. Just this year we changed the focus of the introductory chemistry lab courses to use scientific mathematical skills as a spring board for active learning modules. This change was prompted by student learning assessment report results and conversations that sprang from the assessment.

For additional support that our program has an existence of a culture of continuous improvement based on assessment, please see the following comments from last year's UAC response:

> " The program has added modules on ethical and social issues to help ensure the curricular alignment with university goals, has focused on inquiry learning, and on helping students be able to apply biological knowledge and skill in professional settings, and they weave attention to critical thinking, writing and speaking throughout their curriculum; additionally, the program includes assessment of its majors throughout the curriculum so as to ensure students are progressing in developmentally appropriate ways from introductory courses through the capstone experiences. Examples provided of changes in the assessment process, tightening of outcomes, and additional curricular content all speak to a program in which there is a culture of using assessment for improvement of student learning."

Describe how the program implemented its planned improvements from last year (for 2015-2016 outcomes). Outcome descriptions and planned improvements were copied from the 2016-2017 report by the Office of Planning and Institutional Effectiveness.

Outcome	Planned Improvement	Update *(Indicate when, where, and how planned improvement was completed. If planned improvement was not completed, please provide explanation.)*
Students will use their knowledge to define a scientific problem, design a project, gather and examine data, and draw conclusions about the project.	To improve the quality of our instruction for the instructors administering the DAT rubrics, we plan to return the instruction to the full-time faculty involved with the learning assessment to ensure consistent quality.	The professors responsible for the learning assessment were directly involved with the instruction of those administering the DAT rubrics.

Outcome	Planned Improvement	Update *(Indicate when, where, and how planned improvement was completed. If planned improvement was not completed, please provide explanation.)*
	In order to strengthen student abilities to understand primary research reading, we will continue to offer research reading modules in our courses and emphasize the following aspects. To improve our students' ability to synthesize knowledge and draw conclusions from data and, especially, critically analyze and understand implications for further research from their research reading, we will emphasize these aspects in our course modules. We will continue to promote meaningful research experiences in courses, undergraduate projects and elsewhere throughout our program.	We continued to offer the research reading modules and meaningful research projects as described, with an emphasis on international ESL students. We have begun to develop project modules which integrate biology topics with chemistry and physics topics which we hope will broaden the student's primary research reading skills. All of our program's required courses and most of our elective courses offer one to several research papers and inquiry based projects. Several BIO 433 Research sections are also provided.
Students will make informed, thoughtful ethical decisions about social issues related to science topics.	To ensure excellence in Learning Outcome 5, we will continue to emphasize and update ethical and social issue modules and topics in our courses.	We have continued and also updated ethical and social issue modules and topics in our courses.
Students will demonstrate scientific literacy by their ability to use professional literature to make valid conclusions.	In classroom modules with research readings, we will focus on the students' ability to synthesize knowledge and draw conclusions from data, and critically analyze data to draw implications from data. Based on DAT, GSS, and University Alumni survey information, we will continue to provide engaging and robust scientific literacy modules in our courses.	From information in rubrics and student surveys, for research readings classroom activities we use focus questions to hone student ability to synthesize knowledge and draw conclusions from data, and critically analyze data to draw implications from data.

Provide a response to last year's University Assessment Committee review of the program's learning assessment report: (2015-2016)

We are grateful for the UAC's many positive comments.
The following is the response to:
Item IV. Assessment measures and targets, "A target score of at least 50% the most appropriate? (Perhaps so, given only 55% of the students hit that mark – but for the future, what would the program ideally like to see in terms of scores and percentages of students hitting the target score?)"; and

Item V. Analysis of the results and implications, “What does the exam tell you about areas that need strengthening? An item analysis might prove very helpful? If only 55% of students are hitting the mark, what do you intend to do to improve this result?” and other related comments. The above comments refer to our Exit Exam Survey which is administered to graduating seniors.

As part of development of the assessment process for our two new degrees, the Biochemistry BS and the Biology BA, we are completely rewriting our Exit Exam Survey this year. The content of the current exit exam is organized by courses required for the Biochemistry BS and Biology BS degree. The same exam is used for both the Biochemistry BS and the Biology BS. The new exit exam will be organized based on learning outcomes assessed in the annual student learning report. There will be three exit exams, one each for the Biochemistry BS, the Biology BS, and the Biology BA. The focus of the new exit exams will be not to assess course content mastery as before, but instead will be to assess the learning outcomes. The questions on the exams will tie course content mastery to the programs’ learning outcomes. New performance standards (target scores) will be developed.

Outcomes Assessment 2016-2017

Learning Outcome 1: Apply gained knowledge and experience to a complex, current scientific problem

Outcome and Past Assessment

Learning Outcome 1:
Students will apply to a complex, current scientific problem, gained knowledge and experience. (Identified as an inquiry outcome.)

Is this outcome being reexamined? ☐ Yes ☐ X No

If yes, give a brief summary of previous results (including trends) and any changes made to the program.

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.*
Direct Measures Research Interpretation section of the exit exam	60% of participating students will achieve a score of 50% or more of the available points on the Research Interpretation section of the Exit Exam.	The exit exam was given and evaluated for 14 graduating seniors in 2015, 32 in 2016 and 42 in 2017 and the results analyzed. The Research Reading section consisted of four questions. Please see Attachment 1 for the Exit Exam questions (# 90-# 93) and Appendix 1 for the Exit Exam Instructions and Introductory Script. A professor in the Biology and Physical Sciences Department administered and scored the test.	1) We administered a Research Reading Interpretation Section of the exit exam to graduating seniors. An assistant in the Office of Programs and Institutional Effectiveness collected and analyzed the results. The percentage of students receiving 100%, 75%, 50%, 25% and 0% answers correct was calculated. The percent of students who answered the different questions correctly was evaluated. 2) The percent of students scoring 50% correct or above on the research reading interpretation section in years 2014-15, 2015-16, and 2016-217 are as follows: 36%, 37%, and 51%. The average across the three years is 41%. **The performance standard was not met in any particular year or collectively.** (See Appendix 2 and 3 for details).
Direct, con't.	85% of students' seminar presentations will reflect	Capstone student seminars are presented by all department seniors as part of the coursework	1) A professor in the Biology and Physical Sciences Department analyzed the results based on the

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.*
Senior Seminar evaluation	confidence and ability to propose a research thesis topic, and interpret and discuss primary research at an excellent or good level. Research thesis topics can be based either on current literature or laboratory based research.	for BIO 410. Please see Appendix 4 for a detailed description of the course and evaluation of students. The instructor for the Senior Seminar course evaluated the student presentations and collected the data.	student's score on the Discover Assessment Tool (DAT) Categories I through III (see Attachment 2) and the BIO 410 instructor comments. Criteria for the scores were project focus; information selection and use; and project analysis and synthesis. Ratings of excellent received scores of 4.5 – 5.0; good received 3.25 – 4.5; fair received 2.0 – 3.25; and poor received less than 2.0. Excellent to good scores met our performance standard. 2) In 2014-15, 100% of presentations were good. In 2015-16, 100% of presentations were excellent or good, of which, 97.2% were excellent and 2.8% were good. In 2016-2017, 93% were excellent or good of which, 71.4% were excellent and 21.4% were good. (See Appendix 5a.) **The performance standard was met.**
Direct, con't. Discovery Assessment Tool (DAT) rubric scores	There will be an increase in average DAT scores between first year and fourth year inquiry based projects.	DAT rubric analyses were done for inquiry based projects in a BIO 151 first year fermentation lab, a BIO 300 or BIO 368 mid-degree scientific assignment, and the BIO 410 senior seminar presentation. See Attachment 2 for the DAT rubric.	1) In the BIO 151 labs, the adjunct instructors were first trained and then evaluated the projects. In the BIO 300, BIO 368, and BIO 410 projects, the faculty teaching the course did the evaluation. Each student project received a score based on their performance on individual elements within the selected categories on the DAT rubric. See Attachment 2 for the DAT rubric. Criteria for the scores were project focus; information selection and use; and project analysis, synthesis and presentation. The scores for each individual course was pooled and averaged. The averages were then compared. 2) For year 2014-2015 a steady improvement in average scores (from 3.7 to 4.3) was seen from first year to third year student projects followed

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.*
			by a decrease in average scores (from 4.3 to 3.8) from third year to fourth year student projects. In 2015-16, a steady improvement in average scores (from 3.5 to 4.8) was seen and the same was seen in 2016-17 (from 4.0 to 4.2) from first year through fourth year student projects. See data in Appendix 5b. **The performance was met for those two years.**
Indirect Measures Biology Graduation Senior Survey (GSS) - Evaluation of Preparation (See Appendix 6, applicable questions from 2010-2011 Graduating Senior Survey Biology)	70% of Biology GSS respondents perceive their preparation to be good or excellent**.**	Individual graduating undergraduate seniors answered questions on the survey. The survey asked the student questions regarding their perceptions of their own academic preparation on learning outcomes. The questions which pertained to this outcome were used in the assessment. Out of sixteen questions, four questions pertained. Please see Appendix 6 for the questions. The University administered and collected the survey and analyzed the results.	1) A professor in the Biology and Physical Sciences Department obtained the results from the Office of Planning and Institutional Effectiveness and evaluated the analysis. From the graduating undergraduate biology respondents, the mean percent of those who answered good or excellent preparation to pertinent questions was calculated. 2) Out of a total of eighty respondents (seventeen in 2014-15, twenty-eight in 2015-2016, and thirty-five in 2016-17), a total average of 80.9% (91.2% in 2014-15, 71.4% in 2015-16, and 80.0% in 2016-17) responded good or excellent to the selected questions. The 2014-15 response was especially high, 91.2%. **The performance standard was met.** See Appendix 6 for data.

Interpretation of Results

Extent this Learning Outcome has been achieved by students (Use both direct and indirect measure results)**:**
The performance standards were met and the learning outcome was achieved in all but one measure. In the research interpretation section of the exit exam, forty-one percent (41%) of participating students achieved a score of 50% or more of the available points on the research interpretation section of the exit exam over the past three years. We would like to see improvements in the research interpretation section of the exit exam.

Program strengths and opportunities for improvement relative to assessment of outcome:
Overall, we are pleased with the gained knowledge and skills seen as our students move through the program. Although their ability to interpret and apply information from primary research reading on the exit exam was lower than expected, the quality of their senior seminar presentations (which rests on their understanding and application of primary research reading) was high. A steady improvement in average scores was also seen from first year through fourth year student inquiry based projects. The graduating seniors in the GSS indicated confidence in evaluating information (eighty-one percent felt their preparation was good or excellent), which indicated they had achieved the learning objective.

Discuss planned curricular or program improvements for this year based on assessment of outcome:
Many of the professors have added and are using active learning modules in their courses, which we feel contributed to the learning outcome. And many of these learning modules include research readings. We will continue to use these modules and to develop new ones.

Prompted by the contrast between the strong scores for the other measures and the lower than expected scores on the research interpretation section of the exit exam, we took a look at how the exam actually looks for the students. We found the electronic file was no longer appearing clear and part of the information was cropped from the research figure. We plan to substantially re-do the exit exam this year and will address this situation. In addition, we will continue to more intentionally work within our learning modules to strengthen approaches students take when reading primary research articles.

Learning Outcome 2: In a professional setting, students will demonstrate ability to apply knowledge gained from their Biology and Physical Science major.

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.
Direct Measure Biology forms or surveys for the internship site supervisors' evaluations of the students	We will strive to have all student interns achieve a "4" ("good") or above in each category of evaluation.	The data came from selected questions from returned 2014-15, 2015-16, and 2016-17 Marymount Employer of Internship Performance and/or Internship Site Supervisor Evaluation of Internship Forms for department interns. Please see Appendix 7 for the highlighted selected questions #7, 8, 10, 12, and 13. The chair of the Biology and Physical Sciences Department or the Office of Career Services collected the forms.	1) The individual scores were pooled for the total population and entered into an Excel spreadsheet. The student's performance was ranked either from 5 – 1, where 5 was excellent, 4 good, 3 average, 2 poor and 1 not completed due to unacceptable performance. Definitions of these rankings are as follows: an excellent evaluation was an evaluation in which all responses were completely positive, a good evaluation was almost all positive responses with a few slight reservations, an average evaluation was positive with reservations, and a poor evaluation reflected an academically unprepared student. Employer comments were noted. A professor in the Biology and Physical Sciences Department, analyzed and evaluated the assessment of internship experiences. 2) In the years from 2014-15, 2015-16, 2016-17, 100% of the MU students received an evaluation of "good" or "excellent" from their supervisor. (See Appendix 9a.) The numbers of students in the assessment was 16, 13 and 33, respectively. The comments were overwhelmingly positive. Many employers wanted to hire our students. **The performance standard met.**
Indirect Measures Student assessment of internship experience	For internship activities related to knowledge covered in our program, 100% of students should rank their internship academic preparation as good or excellent.	The data came from returned 2014-15, 2015-16, 2016-17 Marymount Student Evaluation of Internship Experience from department interns. Please see Appendix 8 for the form. The selected questions are highlighted. The chair of the Biology and	1) The individual responses were pooled for the total population and entered into an Excel spreadsheet (summarized in Appendix 9b). The student's assessment of their academic preparation was ranked from 5 – 1, where 5 was excellent (very well prepared), 4 good (well prepared), 3 average (somewhat prepared), 2 poor (not prepared) and 1 not completed due to lack of preparation (absolutely not prepared. Student comments were noted.

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.
		Physical Sciences Department or Office of Career Services collected the internship site supervisor evaluations.	A professor in the Biology and Physical Sciences, analyzed and evaluated the internship site supervisor evaluations 2). In 2014-15, 79%; in 2016-17, 59%; and in 2015-16, 76%, for an overall average of 71.3% said they felt very well or well prepared for internships. See Appendix 9b for data. The performance standard was not met. This was a marked departure from 2012-13 and 2013-14, when 100.0% of respondents said they felt academic preparation for the internships was excellent or good. The student internship survey has since converted from a hard copy survey to an online survey. The hard copy survey questions relating to this measure had been removed. The question substituted is a weak one for this measure. We are working with the Office of Career Services to remedy the situation.
Indirect Measures, con't. Selected questions on the 2014-2015, 2015-2016 Biology Alumni Supplemental Survey	Well or adequately prepared from 85% of respondents.	Data came from the department alumni's responses to selected questions on the Biology Department Alumni Supplemental Survey which was sent to graduates from 2005-6, 2009-10, and 2013-14 in the 2015 survey; and survey and 2010-11 and 2014-15 in the 2016 survey. At the time of writing the report, the 2016-17 survey was not available yet. The supplemental survey was coordinated by the Office of Planning and Institutional Effectiveness and was called the Supplemental Alumni Survey.	1) The Office of Planning and Institutional Effectiveness sent the analyzed results to the professor doing the assessment in the Biology and Physical Sciences Department, who evaluated the analysis. From the graduating undergraduate biology respondents, the mean percent of those who answered good or excellent preparation to pertinent questions was calculated. 2) Of the ten respondents in 2014-15, 100% indicated well or adequately prepared and of the fifteen respondents in 2015-16, 93% indicated well or adequately prepared**.** See Appendix 11 for the data. **The performance standard was met.** The students commented well prepared in a number of subjects. Additional preparation was consistently requested for pharmacology, pathology, and toxicology.

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.
		Please see Appendix 10 for the selected questions.	
Indirect Measures, con't Selected questions on the 2014-15, 2015-16, and 2016-17 Graduating Student Surveys (GSS's)	Good or Excellent ratings on 80% of respondents to selected question	Data came from the department graduates' responses to selected questions on the GSS. Please see Appendix 12 for the selected question. The University administered and collected the survey and analyzed the results.	1) For each question, the percent of the population which answered good or excellent was determined. The University sent the analyzed results to a professor in the Biology and Physical Sciences Department who evaluated the analysis. 2) In 2014-15, 90% of seventeen respondents; in 2015-16, 73% of twenty-eight respondents, and in 2016-17, 80% of thirty-five respondents answered 'Good' or 'Excellent' to the selected question. Although there was a dip in 2015-16, the overall average was 81%. (See data in Appendix 12.) **The performance standard was met.**

Interpretation of Results

Extent this Learning Outcome has been achieved by students (Use both direct and indirect measure results)**:**
The performance standards were met for almost measures. In general Internship supervisors, students, graduating seniors, and alumni indicated enthusiastic confidence in our student's ability to apply their knowledge in a professional setting. As numbers increased, also positive comments increased, thus suggesting our students are prepared for the workforce. We will continue to monitor this measure, especially the Graduating Student Surveys to ensure the scores continue to increase after the dip in 2015-16.

The one exception was with the student internship survey in which the performance standard was not met. This was a marked departure from 2012-13 and 2013-14, when all respondents said they felt academic preparation for the internships was excellent or good. Since the 2013-14 survey, the student internship survey had been converted from a hard copy survey to an online survey. Unknown to the assessors, the hard copy survey questions relating to this measure had been removed. The question substituted for the earlier questions is a weak one for this measure and does not apply well to the measure. We are working with the Office of Career Services to remedy the situation.

Program strengths and opportunities for improvement relative to assessment of outcome:
The internships provide a preliminary experience in the student's desired profession. Our students have confidence going into and coming out of their internships. Their performance is consistently viewed by supervisors as excellent. That confidence is also seen upon graduation. In the alumni surveys, students mention several courses they wish they had had the opportunity to take at Marymount. To help us focus on this during future faculty position searches, we will systematically review

the comments from the alumni survey and keep in mind the comments when looking for faculty expertise. The students are generally very confident in their ability to perform in professional setting. We will continue to monitor the learning outcome to ensure that the general student perceptions remain high.
We are pleased to have much fewer complaints about the lab facilities now that we have moved to the new Caruthers science building.

Discuss planned curricular or program improvements <u>for this year based on assessment of outcome:</u>
To address some of the comments from our alumni surveys, we will make the following improvements. For biochemistry and botany, two courses we implemented in response to repeated student requests, we will continue to improve the active learning modules and lab components to make sure students remain confident in their preparation. We will offer research reading projects in our required courses to ensure scientific literacy. Other suggested classes, including pharmacology, toxicology, and pathology will be taken under consideration.

Outcome and Past Assessment

Learning Outcome 3:

Students will demonstrate competency in basic scientific skills such as observing safe laboratory practices and making solutions.

Is this outcome being reexamined? Yes X No

If yes, give a brief summary of previous results (including trends) and any changes made to the program.

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.*
Direct Measures Evaluation of safety performance in selected courses	Our majors will improve in their safety performance such that less than two relevant laboratory safety incidences will be reported per year for the third and fourth year biology students in selected lab courses.	The students receive lab safety training in all levels of science laboratory sections. The data came from safety records in introductory majors and upper level laboratory sections of selected science courses. The instructor of the laboratory section collected the data. The data is archived in the department lab coordinator's office and in the OSHA–mandated safety notebooks kept in the laboratories.	1) According to OSHA regulations and department procedures, all laboratory safety incidences no matter how insignificant must be reported by the lab instructor, to the faculty member or lab coordinator in charge of the lab section through a laboratory incident form which is then archived. The incidence reports in our introductory BIO151/152 General Biology for Majors lab sections were compared with our upper level BIO 368 Advanced Laboratory Research Methods sections. 2) For 2014-15, 2015-16, and 2016-17, no lab safety incidences were reported in either BIO 151/152 or BIO 368. **The performance standard was met.**
Learning Outcome 3, Direct Measures continued Evaluation of making solutions in selected courses	By the time the students are in an upper level course, 75% of them will be able to make a solution correctly in an unassisted, first attempt.	The instructor for the upper level BIO 368 Advanced Laboratory Research Methods observed the ability of the students to correctly make a solution unassisted on their first attempt in their independently-performed inquiry based project.	1) As students move through the program, they receive instruction and practice about making laboratory solutions correctly. In the upper level BIO 368 Advanced Laboratory Research Methods, the students must make their own solutions for their inquiry based, summative research project. The instructor of the upper level BIO 368 course collected the data. A faculty member of the Biology and Physical Sciences Department analyzed the data.

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.*
			2) In 2015-16, twenty-eight out of thirty-three (85.0%) and in 2016-17, twenty-one out of twenty-eight (75%) made the observed solution correctly on an unassisted first attempt in BIO368. **The performance standard was met.**
Direct Measures continued, Evaluation by internship supervisor	85.0% of the students will achieve a good (rating of 4) or better on a selected question from the evaluation by the internship supervisor.	Most of the internships directly or indirectly require skills learned in the students' lab sections. The data came from returned 2014-17 Internship Supervisor Evaluation of Internship Form's question number ten (see Appendix 7), which refers to the technical skills possessed by the intern. The chair of the Biology and Physical Sciences Department or the Office of Career Services collected the internship site supervisor evaluations.	1) The individual scores were pooled from both employer and supervisor forms for the total population. The student's performance was ranked either from 5 – 1, where 5 was excellent (always satisfied), 4 good (almost always satisfied), 3 average (generally satisfied), 2 poor (often not satisfied) and 1 not completed due to unacceptable performance. Employer and supervisor rankings were pooled. A professor in the Biology and Physical Sciences Department, analyzed and evaluated the assessment of internship experiences 2) In both F2014-S2015, 100% of supervisor respondents (13 in total) said students had excellent (5.0) technical skills appropriate for their internship. In F2016-S2017, 100% of Supervisor respondents (33 in total) said students had good (4) or excellent (5) technical skills appropriate for their internship (The average rating was 4.8). **The performance standard was met.**

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.*
Learning Outcome 3, Indirect Measures Selected questions on the 2014-2015, 2015-2016, and 2016-2017 GSS	Good or Excellent ratings on 80% of respondents to selected questions	Data came from the department graduates' responses to selected questions on the GSS. Please see Appendix 12 for the selected questions. The University administered and collected the survey and analyzed the results.	1) For each question, the percent of the population which answered good or excellent was determined. The University provided the analyzed results to a professor in the Biology and Physical Sciences Department who evaluated the analysis. 2) In 2014-15, an average of 89.7% of seventeen respondents answered 'Good' or 'Excellent' to the selected questions of the GSS. In 2015-16, the number responding 'Good" or Excellent dropped to 73.2% of twenty-eight respondents. In 2016-2017 the number rose back to 80%. **The performance standard was met for 2014-2015, and 2016-2017 but not for 2015-2016.** The 2015-16 class was a weaker class with an average GSS score of 65.9% for preparedness for finding a job in their field compared to 2014-15 scores of 81% which we think led to a lower perception of ability to apply their technical knowledge for the 2015-16 cohort. Please see Appendix 12 for the data.
Indirect, continued Selected question on the 2015 and 2016 Biology Alumni Surveys	Well or adequately prepared from 85% of respondents.	Data came from the department alumni's responses to a selected question on the Biology Department Supplemental Alumni surveys. Surveys were received in 2015 from graduating cohorts 2013-14, 2009-10, and 2005-06. Surveys received in 2016 from graduating cohorts 2014-15 and 2010-11. In the 2015 survey and 2007-2011 in the 2015 survey. See Appendix 13 for the selected question.	1) The Office of Planning and Institutional Effectiveness sent analyzed survey results to a Biology and Physical Sciences professor who evaluated the analysis. From the graduating undergraduate biology alumni respondents, the mean percent of those who answered very well prepared or adequately prepared to a pertinent question was calculated. 2) Of the fifteen respondents in 2016 survey, 93% responded they were very well or adequately prepared academically for their current position. Of the ten respondents in 2015 survey, 100.0% indicated that they were very well or adequately prepared. Please see Appendix 13 for the data. **The performance standard was met.**

Interpretation of Results

Extent this Learning Outcome has been achieved by students (Use both direct and indirect measure results)**:**
The learning objective was achieved. The performance standards were met for all measures except for the indirect measure of the 2015-16 GSS perception of preparedness. As explained above, this particular cohort had an overall average GSS score of 65.9% showing an overall decreased perception of their achievements. The perception score in the 2016-2017 cohort improved and did meet the standard. We will continue to monitor this in future years.

Program strengths and opportunities for improvement relative to assessment of outcome:
Our program provides many opportunities for the students to develop safe and useful technical skills through instruction and exercises in the lab. We see this in the instructor's evaluations of student performance in the labs, the very positive responses we get from the graduating students, alumni and the internship supervisors with100% of the supervisors responding with excellent or good evaluations. Although there was a dip in the 2015-16 graduating seniors' perception preparation, the 2016-2017 value recovered. We will continue to monitor this learning objective to ensure the graduating seniors meet the performance standard for perception of preparation. The standard for the direct measure, 'Evaluation of making solutions in selected courses' was met, but we would like to see a higher percentage of students in upper level courses who could correctly accomplish this very basic technique of making solutions.

Discuss planned curricular or program improvements for this year based on assessment of outcome:
To maintain our strong development of technical lab skills, we will continue to provide many opportunities in lab courses for acquisition and monitor the GSS scores for the selected questions to make sure they continue to improve. In response to the desire to further enhance their skills for job and post-graduate academic opportunities, we will provide additional opportunities for hands-on experiences making solutions in the upper level labs. To more profoundly strengthen student skills, this semester we have already redesigned the introductory chemistry lab modules to make scientific applications of mathematics and lab skills a nexus from which active learning of chemical principals proceed.

Curriculum Map

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

UNDERGRADUATE CURRICULUM MAP

Degree Program: Biology
Year: 2016-17

Program Outcomes: Indicate how your program outcomes map to these competencies.

Program Outcome	Critical Thinking	Inquiry	Information Literacy	Written Communication
Apply gained knowledge and experience to a complex, current scientific problem	X	X	X	X
Demonstrate the ability to apply knowledge gained from the major in a professional setting	X			X
Demonstrate an understanding of and competency in basic scientific skills such as observing safe laboratory practices and making solutions	X	X		
Formulate hypotheses, design a project, and gather and analyze data to address scientific questions	X	X	X	X
Display an understanding of ethical dilemmas and social issues and apply their understanding to situations in professional settings	X		X	X
Demonstrate scientific literacy by communicating synthesis of knowledge and critical analysis of read scientific information	X	X	X	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: 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

Bio224	R	E	R	E	R	E, OT- Class Discussion and Readings	R	E
Bio250/250L	R	E, P, O, LE	R	P, O, LE	R	O, P	R	E, P, LE
Bio260/260L	R	E, LE	R	O, LE	R			
Bio262/262L	R	E, LE	R	LE	R	OT-literacy assignment		
Bio272/272L	R	E, LE	R	LE				
Bio300	R	A, P, INQ	R	INQ	R	P, INQ, OT-Class Discussion and Readings	R	P
Bio327							R	O
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
Bio444/444L								
Bio446	M	E, INQ	M	INQ, P, O	M	INQ, P, O	M	P, O
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
CHM222/222L	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		
PHYS271/271L	R	E, INQ, LE	R	E, LE	R	OT - citizen science	R	O, LE