

## ASSESSMENT REPORT 2016-2017

**Biology Undergraduate**  
(Instructional Degree Program)

**B.S./B.A.**  
(Degree Level)

### **Program Mission:**

The mission of the Biology program is to provide undergraduate and graduate students with a high quality science education that includes experience with research and field projects. The program provides a scientific and technical background that empowers students to successfully pursue science and technology careers, or proceed on to advanced graduate studies.

### **Student Learning Outcome 1:**

Have a command of basic biological knowledge in the areas of ecology and evolution, cell and molecular biology and organismal biology.

### **NMHU Traits Specifically Linked to Student Learning Outcome 1**

- Mastery of Content Knowledge and Skills

### **First Means of Assessment for Outcome 1:**

Successful students will master course content in representative upper level major courses, with an average grade of "C" or better on class tests and laboratory reports in Biol 389 (Fall 2016), 331 (Fall 2016). 75% or more students will meet our criteria for success.

### **Summary of Data:**

Number of Students Meeting Criterion:	42	Number of Students Not Meeting Criterion:	3
Total Number of Students Assessed:	45	Percent of Students Meeting Criterion:	93%

### **Second Means of Assessment for Outcome 1:**

Graduating seniors will take the MFAT test. This test will allow us to track individual performance over time. The MFAT test is more a measure of determining how our students compare to national averages.

**Summary of Data:** The MFAT was not given to students this academic year.

Number of Students Meeting Criterion:	N/A	Number of Students Not Meeting Criterion:	N/A
Total Number of Students Assessed:	N/A	Percent of Students Meeting Criterion:	N/A

### **Interpretation of Results for Outcome 1:**

Upper level biology students successfully met our Student Learning Outcome (SLO) 1, having a command of biological knowledge. The courses sampled are at the junior and senior level and reflect a general trend of student competency in course content mastery in the Biology Program. Our future focus will be on extending this SLO to include freshmen/sophomore level courses in data collection for this outcome. We are also revising our outcomes assessment plan to determine if we are keeping SLO 1B, the standardized MFAT test as a metric for this outcome or if there is an alternative way to determine student mastery of biology content compared to national standards.

### **Student Learning Outcome 2:**

Have an understanding of and the ability to use scientific methodology and technology through which biological knowledge accumulates.

### **NMHU Traits Specifically Linked to Student Learning Outcome 2**

- Effective Communication Skills
- Effective Use of Technology

### **First Means of Assessment for Outcome 2:**

Senior project-successful students will show mastery and apply knowledge of basic biological principles to a degree that is satisfactory to the faculty of the biology discipline as indicated by a grade of “B” or better in Biol 491 (Fall 2015) and Biol 498 (Spring 2016). 75% or more of students will meet our criteria for success.

#### **Summary of Data**

Number of Students Meeting Criterion:	14	Number of Students Not Meeting Criterion:	0
Total Number of Students Assessed:	14	Percent of Students Meeting Criterion:	100%

### **Second Means of Assessment for Outcome 2:**

Mastery of laboratory skills and techniques demonstrated by an average grade of “C” or better on laboratory reports for representative upper level courses: Biol 389 and Biol 331 Fall 2015. 75% or more of students will meet our criteria for success.

#### **Summary of Data:**

Number of Students Meeting Criterion:	44	Number of Students Not Meeting Criterion:	10
Total Number of Students Assessed:	54	Percent of Students Meeting Criterion:	81%

### **Interpretation of Results for Outcome 2:**

Both measures of SLO 2 demonstrate successful mastery of this outcome among biology program students. Students demonstrated their ability to use the scientific method and technology at the senior level in capstone research courses and in junior and senior course labs. As in other areas of outcomes assessment, the program plans to revise our outcomes plan to determine whether sophomore course outcomes can be incorporated into this SLO. We also plan to discuss ways of further strengthening student laboratory and technical skills to increase the percent of students meeting SLO 2B (currently 81%) by examining these skills in curriculum mapping in the coming year.

### **Student Learning Outcome 3:**

Be able to effectively communicate and critically analyze biological knowledge.

### **NMHU Traits Specifically Linked to Student Learning Outcome 3**

- Effective Communication Skills
- Critical and Reflective Thinking Skills
- Effective Use of Technology

### **First Means of Assessment for Outcome 3:**

Successful students will demonstrate mastery with scores of "B" or better for research papers and/or oral presentations in representative upper level courses, Biol 491 (Fall 2015), Biol 498 (SP 2016), Biol 389 (Fall 2015)

#### **Summary of Data**

Number of Students Meeting Criterion:	14	Number of Students Not Meeting Criterion:	0
Total Number of Students Assessed:	14	Percent of Students Meeting Criterion:	100%

### **Second Means of Assessment for Outcome 3:**

Successful students will show mastery and apply knowledge of basic biological principles to a degree that is satisfactory to the faculty of the biology discipline as indicated by a grade of "B" or better on the Senior project (Biol 498 Spring 2016). 75% or more of students will meet our criteria for success.

#### **Summary of Data**

Number of Students Meeting Criterion:	14	Number of Students Not Meeting Criterion:	0
Total Number of Students Assessed:	14	Percent of Students Meeting Criterion:	100%

### **Interpretation of Results for Outcome 3:**

We measured biology student ability to communicate and analyze biological knowledge through assessment of the senior project performance (capstone research). Students successfully met the criteria set for this SLO. We would like to examine other courses to assess these communication and analysis skills earlier in our program by expanding the SLO to include sophomore and junior level courses. We also plan to use curriculum mapping to track writing skills through biology courses because this SLO does not entirely reflect challenges with writing that students typically have at the senior level in our courses.

### **Student Learning Outcome 4:**

Receive a comprehensive background essential to advanced work and/or a career in biology or related fields.

### **NMHU Traits Specifically Linked to Student Learning Outcome 4**

- Mastery of Content Knowledge and Skills
- Effective Communication Skills
- Critical and Reflective Thinking Skills

### **First Means of Assessment for Outcome 4:**

The student satisfaction survey administered to all graduating seniors by the Office of Institutional Research and Effectiveness. Measures of success- 50% or more of respondents indicate that they are continuing their education or employment in biology or related area. 75% of the respondents will indicate that they are satisfied or very satisfied with their preparation for work or graduate school. Faculty knowledge will be used to collect information on career paths of students who graduated the previous year.

**Summary of Data:** due to changes at OIER, we have not yet collected this data.

Number of Students Meeting Criterion:	10	Number of Students Not Meeting Criterion:	0
Total Number of Students Assessed:	10	Percent of Students Meeting Criterion:	100%

### **Interpretation of Results for Outcome 4:**

Biology graduates successfully met the criteria of SLO 4, demonstrating that our biology program adequately prepares students for a career in biology or a related field. Our sample size was small, reflecting slow attrition over the four year of our program. We outline in the general comments below suggested ways of addressing the overall goal of improving graduation numbers in our program.

### **Utilization of Results:**

We plan to utilize results to revise our outcomes assessment plan for the coming year. In particular, the low sample numbers for some SLOs suggest we need to revise the types and levels of courses we choose for data gathering. Additional data were available this year to include demographic and high risk student factors with student outcomes. We reviewed these data in relation to each SLO, and we did not find trends in which students are successful and which students may need additional resources. Our revised outcomes assessment plan will include broader sampling of our courses resulting in larger sample numbers to better make use of available demographic data.

We also analyzed multi-year trends in retention and graduation rates in biology at NMHU. From 2006 to 2016, Biology degrees awarded have increased on average, though not consistently, year to year. Declared biology majors during this ten year time period have fluctuated and then slowly declined over the last four years.

Our fall to fall first time full time freshmen retention in biology was, on average, 48.4% (years 2011-2015). When we include transfers into our program, the second year cohort retention is 67.4% for the same time period. These retention rates are similar to the general trend in retention for NMHU (~48-52% retention fall to fall).

Our average four-year retention (years 2011, 2012, 2013) is 42.1% in Biology. In previous years (2000-2009) the four-year retention was 31.6%.

We also identified significant trends in sub-populations of biology students that have been identified at NMHU as at-risk for degree completion (Ruffalo Noel Levitz Analysis). Many first time full time freshmen in biology were identified as needing attention in our future retention plans based on their membership in at-risk sub-populations: Financial aid <\$4,254 (2015: 48%, 2016: 39% of biology freshmen), High school GPA <2.935 (2015: 39%, 2016: 35% of biology freshmen), Native American & African American Ethnicity (2015: 35%, 2016: 6% of biology freshmen), and home location 93-540 miles away from campus (2015: 70%, 2016: 52% of biology freshmen).

### **Changes to Program Based on Results:**

The outcomes assessment metrics were all successful demonstrating a range of learning outcomes met by students in the Biology Program. We identified the need to improve 1) sample sizes in collected data, 2) outcomes assessment at freshmen and sophomore level, and 3) some outcomes that may not be reliably measured each year (e.g. MFAT national test). To address these areas of improvement, we will be revising our program outcomes assessment plan this year and prioritize which areas of improvement will receive more focus. Our first step in outcomes plan revisions will be curriculum mapping of the Biology B.A./B.S. program to identify where desired outcomes (skills and content) are introduced, reinforced, and mastered. Such mapping will guide

us in identifying critical junctures in the program to gather assessment data and more evenly distribute course assessments across 200-400 level courses.

Our analysis of graduation and retention rates in the Biology Program suggests that we have steadily increased the number of biology degrees awarded and we will need to improve the numbers of declared majors to maintain this trend. We plan to address the slow decline in declared majors by 1) improving recruiting methods to inform potential students about the degree options and career opportunities for biology majors, 2) evaluating road blocks in the science core and biology curriculum that may be discouraging to students, 3) re-focusing our co-curricular activities in biology as a Biology Club with opportunities to attend local events and create an active biology student cohort, and 4) improving advising practices and setting the goal of advising each biology student once a semester.

The first time full time freshmen data indicate that we have several at-risk sub-populations in biology. Students who have financial concerns and live further away from home make up 40-50% of our freshmen in biology. We work closely with ARMAS and the supplemental instruction program to provide a comfortable and supporting studying environment that may help this particular group of students. We would like to improve the co-curricular activities through a Biology Club to provide a more connected biology community and peer support for these students. Additionally, we plan to gather a list of potential work-study jobs available in the Biology Department to advertise to students so that students can meet financial needs while working directly with Biology faculty, staff, and students.

Over a third of Biology first time full time freshmen have low GPAs from High School. We have improved the range of active learning and high impact practices included in our freshmen biology courses which should make courses more accessible to underprepared students. We will continue improving learning strategies in the classroom such as “universal design” as well as connect students to near-peer mentors in the SIL ARMAS program. Our planned curriculum mapping will also help to ensure that skills are carefully scaffolded and reinforced throughout the four-year program as part of best teaching practices.

### **Retention Strategies:**

We identified several improvements to increase retention in the Biology Program:

A) Curriculum level planning: We will use curriculum mapping and student surveys to discover where students face the greatest challenges or road blocks in their progress and evaluate whether changes to our program could improve outcomes. We recently did this by creating a B.A. degree option to give students more flexibility in their course work.

At the curriculum level, we also will continue revisions to improve the timing of high impact practices which ideally occur early with freshmen courses and continue through the program to capstone research projects.

B) Advising: We plan to track each biology student and ensure each student has a biology professor advising them. Our goal is to have the student and advisor meet once a semester and for all biology faculty to be fully trained in Degree Audit and track progress with the associated planner.

C: Co-curricular activities and work study: We plan to reinstate the Biology Club as a peer cohort of biology students with local science field trips. We plan to advertise work study opportunities in the biology department for biology majors.

D. Program promotion: We have revised promotion materials to recruit new students to the biology program. We plan to have an informational board in the science building with biology major advice and career paths. We would like to invite successful graduates back to NMHU to meet with biology majors.