New Mexico State University

Detailed Assessment Report
2015 - 2016 Biology Undergraduate
As of: 12/02/2016 11:37 AM MDT
(Includes those Action Plans with Budget Amounts marked *One-Time, Recurring, No Request*.)

Mission / Purpose

The mission of New Mexico State University is to serve the people of New Mexico through education, research, extension education, and public service, with special emphasis on preserving the state's multi-cultural heritage, protecting its environment, and fostering its economic development in an interdependent world. New Mexico State University is an equal opportunity institution welcoming all within our community, regardless of sex, color, or other circumstance. The purposes of the NMSU Department of Biology align with those of the University, in that we see our responsibilities falling into the general areas of teaching, research, and professional service. The first two are considered to be synergistic and of equal importance; graduate and undergraduate instruction is enriched by student involvement in research, and instructors involved in research typically convey more current and higher-quality instruction. The third area, professional service, is an important part of departmental activity. In addition to these primary responsibilities, we see leadership as an important element of our activities and, when applicable, extension and outreach as contributing positively to our mission.

Goals/Objectives

G 1: Goal 1: Basic Biological Knowledge
Goal 1: teach our students basic knowledge in biology

G 2: Goal 2: Skills and Interdisciplinary Connections
Goal 2: provide students with skills to enhance basic biological knowledge and, where possible, the relationship of biology to other academic disciplines

G 3: Goal 3: Scientific Inquiry and Communication
Goal 3: engage students in critical scientific inquiry, and provide opportunities to communicate scientific information clearly in preparation for employment and/or continuing advanced education in the life sciences

G 4: Goal 4: Biological Understanding for Non-scientific Careers
Goal 4: promote understanding of biological science for those not seeking scientific careers

G 5: Objective 1: Biological Knowledge for Career
Objective 1: students will have gained sufficient understanding of relevant biological facts and concepts to enter their chosen professional discipline or begin post-baccalaureate studies.

G 6: Objective 2: Effective Communication
Objective 2: students will be able to communicate effectively in a variety of modalities (e.g. discussions, oral presentations, scientific writing), and will be able to address questions and comments about their work in a meaningful way

G 7: Objective 3: Biological Problem-Solving
Objective 3: students will be able to use appropriate approaches to evaluate biological problems and hypotheses in the context of biological facts and principles and in the context of relevant interdisciplinary concepts

G 8: Objective 4: Experimental Design
Objective 4: students will be able to design meaningful experiments to address biological questions

G 9: Objective 5: Community Connections
Objective 5: students will have developed meaningful connections within a community of peers, instructors, researchers and staff in a Biology department

Student Learning Outcomes, with Any Associations and Related Measures, Targets, Findings, and Action Plans

S 1: 2014-2015 QI Writing Outcome
Students will be able to communicate their scientific results effectively (in writing) to both a scientific and general audience.

Connected Document
Biology UG QI Rubric (2014-2015)

Related Measures

M 1: Biology Honors Thesis
Students write up their research and results in the style of a scientific journal article (each student writes in the format of a journal in their particular discipline).

Source of Evidence: Senior thesis or culminating major project

Connected Document
Biology UG QI Rubric (2014-2015)

Target:
Fall 2014: Student theses should be strong in terms of the background and context of the work. As the research may be on-going, we will not be surprised if there are issues with presenting the data in the theses produced during a Fall semester course.

Related Action Plans (by Established cycle, then alpha):
For full information, see the *Details of Action Plans* section of this report.

2015-2016 Action Plan
Established in Cycle: 2014 - 2015
While we successfully completed our 2015-2015 plan, and established preliminary baseline data for senior students writing a th...

M 2: Press Release
Each student writes a press release for a local newspaper describing their own (2014-2015) or another student's (2015-2016) research. The goal is that a non-scientist can understand the purpose and importance of the research.

Source of Evidence: Written assignment(s), usually scored by a rubric

Connected Document
> [Biology UG QI Rubric (2014-2015)](#)

Target:
2014-2015: We anticipate that this less formal type of scientific writing may be easier for students, and it may be more similar to the kinds of writing that they have done in non-Biology courses. We anticipate that students will struggle most with clearly communicating their science to a non-scientific audience (that is, their press releases may "shoot too high" for the intended audience).

Related Action Plans (by Established cycle, then alpha):
For full information, see the *Details of Action Plans* section of this report.

2015-2016 Action Plan
Established in Cycle: 2014 - 2015
While we successfully completed our 2015-2015 plan, and established preliminary baseline data for senior students writing a th...

S 2: 2015-2016 Biology Undergraduate Writing
Students will be able to communicate their scientific results effectively (in writing) to both a scientific and general audience.

Connected Document
> [2015-2016 Biology Writing Rubric](#)

Relevant Associations:

General Education / State Common Core Associations

3.3 Communicate scientific information.

Baccalaureate Experience Learning Objectives Associations

3 Effective Communication - Students engage and create valuable experiences through the exchange of meaningful thoughts and ideas with others.
6 Information Literacy - Students consistently, successfully and efficiently find and evaluate information and use it in appropriate and ethical ways.
11 Creativity - Students express ideas and produce work that is innovative, original and uniquely their own.

Related Measures

M 1: Biology Honors Thesis
Students write up their research and results in the style of a scientific journal article (each student writes in the format of a journal in their particular discipline).

Source of Evidence: Senior thesis or culminating major project

Connected Document
> [Biology UG QI Rubric (2014-2015)](#)

Target:
Fall 2015: As anticipated, "Information and its Presentation" had the lowest score of all categories of our rubric in 2014-2015. The average score for this category was 1.33 (out of 3). While there are challenges associated with this (research is on-going, so students may not have full data sets), we would like to see an improvement in this category. If this category can reach the scores attained on the other categories in 2014-2015 (e.g. ~1.9), we feel that would represent substantial improvement. We would also like to see an improvement in "Purpose and Context" from 1.92 (2014-2015) to 2.5. Purpose and context should be something that HHMI students can address proficiently, given the amount of time they have spent on their research.

Finding (2015 - 2016) - Target: Partially Met
Findings (2015-2016) Target: Mixed Results 1. "Information and its Presentation": Target Met We had wanted to see an improvement in "Information and its Presentation" from 1.33 (out of 3) to 1.9 (out of 3). The average score across the 8 theses scored in the 2015-2016 cycle was 2 (out of 3) (67%). This may reflect the fact that more students had completed their data collection in time to write it up in the Fall 2015 thesis course. 2. Purpose and Context: Target Not Met We had wanted to see an improvement in "Purpose and Context" from 1.92 (in the 2014-2015 cycle) to 2.5 (out of 3) in the 2015-2016 cycle. The average score for "Purpose and Context" for the 8 theses scored in the 2015-2016 cycle was 2 (out of 3) (67%). While we have not run statistical tests, this modest improvement likely does not reflect a true improvement in the presentation of "Purpose and Context" by our students. This area represents an area for more targeted efforts for improvement. 3. Overall, the theses were scored as "emerging" (the middle category of our three-category rubric). Purpose and Context and Information each had an average score of 2 (out of 3). We (as a department) need to discuss our next steps, based on this somewhat stable writing performance on a scientific writing task by a highly selected group of students. Please see the Comparison Graph document (document manager) that documents the scores (expressed as % of total possible rubric points) for the theses and press releases for 2014-2015 and 2015-2016.

Related Action Plans (by Established cycle, then alpha):
For full information, see the *Details of Action Plans* section of this report.

Action Plan for 2016-2017
Established in Cycle: 2015 - 2016

Our plan is to treat the 2016-2017 assessment as a pilot to evaluate the effectiveness of embedded assignments at helping stud...

M 2: Press Release
Each student writes a press release for a local newspaper describing their own (2014-2015) or another student's (2015-2016) research. The goal is that a non-scientist can understand the purpose and importance of the research.

Source of Evidence: Written assignment(s), usually scored by a rubric

Connected Document
> [Biology UG QI Rubric (2014-2015)](#)

Target:
2015-2016: If the performance level on the press release is stable in the 2015-2016 cycle, then we will discuss strategies to increase the overall press-release (non-scientific writing) scores to at least 2.5 (out of 3) across the board. The 2014-2015 category scores ranged from 2.1-2.3.

Finding (2015 - 2016) - Target: Not Met
Findings (2015-2016) Target: Not Met (stable performance on the press release assignment, but not an increase to 2.5 out of 3) In the 2015-2016 cycle, we wanted to see if the performance level on this "writing for the general public" was stable/comparable to the previous cycle. We found that the 7 press releases had a range of rubric subscores from 1.9 to 2.4 (out of 3), and that the average total score was 8.6/12 (71.7%). This is very comparable to the previous cycle. Having established a baseline that is "acceptable" for this form of writing, in this population of students, we (as a department) need to discuss our next steps in this evaluation, given that we did not meet the target of an average of 2.5 (out of 3) across the board. Please see the Comparison Graph document (document manager) that document the scores (expressed as % of total possible rubric points) for the theses and press releases for 2014-2015 and 2015-2016.

Related Action Plans (by Established cycle, then alpha):
For full information, see the *Details of Action Plans* section of this report.

Action Plan for 2016-2017
Established in Cycle: 2015 - 2016
Our plan is to treat the 2016-2017 assessment as a pilot to evaluate the effectiveness of embedded assignments at helping stud...

Details of Action Plans for This Cycle (by Established cycle, then alpha)

2015-2016 Action Plan
While we successfully completed our 2015-2015 plan, and established preliminary baseline data for senior students writing a thesis and press release [all in the "middle" category- Acceptable (press release) and Emerging (thesis)], questions have been raised about how representative these assignments are of our entire senior cohort- which includes students with no research participation, students who participate in other (non-HHMI) programs, and the small and highly selected cohort of HHMI research scholars (the focus of our first writing assessment). We welcome feedback regarding future strategies. As this was our first year to assess writing, and as we know that there can be year-to-year differences in cohorts of students in classes, the Undergraduate Curriculum Committee has decided to repeat this QI assessment in the 2015-2016 academic year. We want to be sure that we have a representative baseline for future comparisons. We have discussed the current results with the instructor of the thesis course, and have shared the QI Writing Rubrics with the instructor. Similarly, we will look forward to the opportunity to present these results at a faculty meeting, so that the faculty as a whole can discuss opportunities for writing practice across the biology curriculum.

Established in Cycle: 2014 - 2015
Implementation Status: Planned
Priority: High

Relationships (Measure | Outcome):
> **Measure:** Biology Honors Thesis | **Outcome:** 2014-2015 QI Writing Outcome
> **Measure:** Press Release | **Outcome:** 2014-2015 QI Writing Outcome

Implementation Description: We will use the same implementation strategy as we did in the 2014-2015 academic year.
Projected Completion Date: 03/2016
Responsible Person/Group: Biology Undergraduate Curriculum Committee (Chair: Michele Shuster)
Additional Resources: Volunteer scorers Time (e.g. the time regularly scheduled for a faculty meeting) in the Spring semester to hold a norming session with the volunteer scorers.

Action Plan for 2016-2017
Our plan is to treat the 2016-2017 assessment as a pilot to evaluate the effectiveness of embedded assignments at helping students develop specific skills during their progression through the biology major. Our findings will then inform subsequent assessment cycles. Based on our 2015-2016 outcome assessment findings, we have two main goals for the 2016-2017 academic year assessment: 1. to expand the scope of the assessment (beyond the handful of seniors in the HHMI thesis course) 2. to focus on developmental activities earlier in the curriculum that we hope will provide scaffolding for the kinds of writing we have been evaluating in the HHMI thesis course We will address these goals by embedding structured activities in introductory and upper-division courses in our curriculum, to provide scaffolded support for students to develop specific writing/communication skills. A. In order to improve the area of "Information and its Presentation", Dr. Marion will embed a structured "data display" activity into one of Biol 111GL or Biol 211GL (our introductory labs that are a requirement for Biology majors). She will also work with the TAs to emphasize the importance of clear presentation of results throughout the semester. The specific areas that will be focused on in the data display activity will include: (i) appropriate method of data presentation (table or graph/which type of graph), (ii) appropriate labels, (iii) descriptive titles and legends (these are all areas that were often weak in the HHMI theses). The UG curriculum committee will develop a new rubric for review of these activities (we will score a sample of activities completed by Biology majors). The rubric will focus on the above-noted areas. B. In order to improve "writing for the general public", Dr. Shuster will embed a structured writing project into her upper division Biol 385 (Intro to Cancer) course. As immunotherapy is an emerging area of cancer therapy, the final course project will be the production of an "informational brochure" for a physician to give to a patient after recommending immunotherapy. This will require describing a complex treatment (with complex scientific underpinnings) in a clear, accurate way for a non-scientist (the patient) to understand. While the final product will be scored for the purposes of outcomes assessment, the class

assignment will be developed using a scaffolded approach. This will ensure that students demonstrate an accurate scientific understanding of the specific therapy before they begin to draft their patient brochure. As such, this assignment satisfies as class goal of being able to "use their understanding of the molecular and cellular biology of cancer to explain the rationale for cancer therapy" and also provides an opportunity for Biology majors to work on communicating scientific information to the general public (a Quality Initiative/UG Outcomes objective). The UG curriculum committee will review the existing writing rubric, and revise it as necessary to evaluate this kind of scientific writing for the general public.

Established in Cycle: 2015 - 2016
Implementation Status: Planned
Priority: High

Relationships (Measure | Outcome):
> **Measure:** Biology Honors Thesis | **Outcome:** 2015-2016 Biology Undergraduate Writing
> **Measure:** Press Release | **Outcome:** 2015-2016 Biology Undergraduate Writing

Implementation Description: 1. Scaffolded activities will be implemented in the Fall 2016 semester (Intro Labs and Biol 385, Intro to Cancer) 2. Biology UG Curriculum committee will develop the new rubrics (Fall 2016) 3. Scoring of student work by faculty and graduate student volunteers will take place in Spring 2017
Projected Completion Date: 04/2017
Responsible Person/Group: Biology Undergraduate Curriculum Committee (Michèle Shuster, Chair)
Additional Resources: Faculty and graduate student volunteers to score student work. Scoring will take place in the Spring 2017 semester.

Analysis Questions and Analysis Answers

1. Engagement: How did you engage faculty, administrators, staff, students and/or other stakeholders in discussing results of the assessment and determining the effectiveness of the assessment in measuring the identified outcome(s)? Include meeting dates, topics of discussions, audience and any decisions made.

Faculty and graduate students were invited to participate in a rubric and scoring norming session for the QI assessment. We had 11 faculty and professional staff and three graduate students volunteer. As in the previous year, we split into two groups- the press release group and the thesis group for the norming. We used a press release and a thesis from a non-biology major (but who took the thesis class) as the norming instrument. There was a fair amount of discussion during the norming session, but by the end of the session, the volunteer scorers seemed to be comfortable with the rubric. All reviewers submitted scores to the Chair of the Undergraduate Curriculum Committee for compilation and presentation. The undergraduate curriculum committee reviewed the results, and Dr. Shuster and Dr. Marion met several times to discuss embedding informal writing and data presentation activities into an introductory biology lab and upper division cancer course.

2. Impact: Discuss the impact of your assessment. Does the data collected answer the question you had about the intended outcome? If not, why? Did you learn anything about the intended outcome you did not anticipate? If so, what? Did the assessment provide sufficient information about the outcome that you can now make informed decisions about programs/practices or specific, directed improvements to programs/practices?

We used this assessment to ascertain how stable our initial assessment results are, and to see if we could document improvements in specific areas. The results are consistent with a "stable" performance, more so than a consistent pattern of improvement. While these are small numbers of students, and it is hard to draw a conclusion, it does seem apparent that we are not going to continue to learn more about our students' writing unless we start to look at writing outside of the thesis class. As two areas presented some concern (informal writing and information and its presentation), we have decided to embed some writing assignments and data presentation activities earlier in the curriculum. We will be interested to know how students perform on these activities (i.e. are the activities accomplishing a goal of helping students with informal scientific writing and data presentation?). If there are indicators that students are able to accomplish these tasks (particularly in non-writing intensive courses), then we can discuss the value of embedding more of these activities throughout the curriculum.

3. What specifically did your assessment show regarding proven strengths or progress you made on outcomes/objectives? (Strengths)

With the small numbers of students, it is hard to draw definitive conclusions, but our students appear to have stable (emerging) performances on their senior theses and press releases. Our progress (as a department) has been our ability to realize that we (as a department) need to do some more exploration (scaffolded instruction) and assessment in order to truly learn more about our students' ability to present data and communicate scientific information to a non-scientific audience. Specifically, we are trying to introduce some additional activities into two classes (an introductory biology lab and an upper-division cancer course), to begin to look at how such activities will play out (particularly in a course that is not intended to be writing intensive- this is in contrast to the thesis course, which is very writing-intensive).

4. What specifically did your assessment show regarding opportunities for improvement. Describe how you intend to address those issues over the next year. If you met all targets, what specifically do you intend to do in the next assessment cycle to promote continuous improvement in your area?

As noted elsewhere, we have decided that we need to explore writing (specifically informal science writing for a non-technical audience) in courses across our curriculum. If we expect students to be proficient at these tasks, then they will presumably benefit from additional opportunities to practice. On the other hand, as these writing activities will be embedded in courses that are not specifically directed at writing (as the thesis course is), an isolated assignment as part of a content-intensive course may not be sufficient for comprehensive skills development. We will need to evaluate how students perform on these new course-embedded activities, and then consider next steps. Such next steps could include revising the course-embedded writing/data presentation activities to enhance their effectiveness, or expanding the reach of such activities to additional courses in the undergraduate curriculum. Ultimately, if such activities were strategically deployed throughout the curriculum, we could potentially have all of our students complete e.g. two or three of these prior to graduation (which should have a larger impact than the 10-15 students who complete the thesis course each year). However, we will not consider broad deployment until we have several semesters of data that indicate that these embedded activities are indeed effective. We may discover that these activities are not effective, and will then need to re-think how to reinforce and scaffold these skills in our curriculum.

5. Specifically, what have you learned about your program, and/or your students' learning?

Our HHMI students are emerging/acceptable writers. We are now interested in learning more about a broader population of our biology majors.

6. Provide a brief summary of your program, department, or unit's activities in the current assessment cycle. You might want to describe a major accomplishment or explain how your area contributed to Baccalaureate Experience learning, or to Vision 2020. Alternatively you may want to discuss how your program is using this assessment to inform decisions and actions for improvement. This summary should be appropriate for broad audiences.

We carried out what was essentially a confirmatory assessment of students' writing (both technical and informal) in a writing-intensive thesis course. Given essentially stable performances (year-to-year), we are now ready to expand our activities (both instructional and assessment) to reach a larger proportion of our students in non-writing intensive courses. We are curious to know how effective an informal writing assignment and a data presentation assignment (embedded into non-writing intensive courses) will be at helping students become proficient with these two skills. We anticipate that we may need to learn from this first iteration and make tweaks to the new activities. If we are able to successfully incorporate data presentation and informal (non-technical) science writing activities into our "regular" (non-writing intensive) courses, then we could consider how to deploy these across a broader swath of courses, such that every biology major will have multiple opportunities to practice these skills as they progress through the major.