Program Name: Biology (General Track)

Assessed by: Jeff Goff, Dept. of Natural Sciences

Date/Cycle of Assessment: Submitted on 1/8/2021;
Reporting cycle of January 2019 – December 2019

Mission Statement:

The Malone University Department of Natural Sciences exists to engage students in the study of God's majesty and character by exploring His handiwork as it is revealed in Nature, both animate and inanimate; to promote the wise and thoughtful stewardship of the natural resources He has entrusted to us; and to encourage students to demonstrate God's love in their respective communities by using the knowledge and skills they acquire here.

Program Goals:

- Students should comprehend the central concepts of biology, the underlying assumptions of biological knowledge, and be able to employ the methods of inquiry commonly utilized by practicing biologists at a level sufficient for entrance into graduate school, professional schools, and other biological vocations (Stems from Malone Educ. Goals A4, D1, and D3).
- Students should become proficient in solving biological problems using both quantitative and qualitative approaches and in analyzing / interpreting data generated by experimental protocols commonly employed by practicing biologists (Stems from Malone Educ. Goals C3, D4, and D5).
- Students should be able to apply the principles of Christian Stewardship to biological practice and interpret biological phenomena within a Christian worldview (Stems from Malone Educ. Goals D2, E1, and E5).

MALONE UNIVERSITY ANNUAL ASSESSMENT REPORT (See Appendix for Raw Data and Detailed Analysis)

Department: *Natural Sciences*
Program: *Biology (General Track)*
Assessed by: *Jeffrey M. Goff - Dept. of Natural Sciences*
Time Period Covered: *January 2019-December 2019*
Submission Date: *1/8/2021*

Program Intended Learning Outcomes (PILO)	Means of Program Assessment & Criteria for Success	Summary of Data Collected	Use of Results
Demonstrate the capability of integrating data and assessing phenomena within a Christian paradigm (Departmental Outcome A).	1) Average cumulative score $\geq$ 12; minimum cumulative score of 8; no individual component score of 1 on the Faith and Learning Assessment Instrument as scored by the associated rubric.	Average composite score = 14.17; minimum composite score = 10; all individual component scores were 2 or higher.	Average composite score, all individual composite scores, and all individual component scores met the departmental criteria for success. No changes to curriculum deemed necessary. Nevertheless, some changes to the wordings of the prompts are anticipated due to the fact that some student responses indicated a misunderstanding of the prompts.
Demonstrate a comprehension of the central concepts of chemistry including the major theories and laws which govern chemical phenomena (Departmental Outcome B).	1) Mean score no lower than 0.5σ below national mean and no individual score lower than 1.5σ below the national mean on the ACS Gen Chem II Exam when administered as a post-test. 2) Average Cohort score on ACS Gen Chem II Exam should show at least a 70.0% improvement over the average cohort score when used as a pre-test.	1) Mean score on the ACS Gen Chem Exam is 33.06 (-0.44σ). This year, three students failed to meet the -1.5σ criterion with scores of -1.55σ, -1.64σ, and -1.91σ. 2) Class average on ACS Gen Chem pre-test is 18.30 giving strong evidence of student improvement (80.7% improvement in score from pre-test to post-test).	This year, the class average met the –0.5σ criterion, but we had three individual scores that failed to meet the –1.5σ criterion. Although the individual scores are disappointing, the cohort average is higher than 7 cohort averages collected over the last 12 years. Although several reasons were listed in the appendix in support of the fact that results on this instrument need to be used "with a grain of salt", we are encouraged by the improvement. The improvement over the last 2 years might possibly reflect the introduction of the new, alternative "Zoo Chem" option for Zoo & Wildlife Biology majors. Over the next year or 2, the efficacy of this curriculum change should become more conclusive. The department has opted to postpone any remedial chemistry course development until this time window is complete. The ACS Gen Chem II pre-test scores, when compared to the post-test scores, are extremely strong evidence that our students are improving as a result of our freshman chemistry sequence. The department has concluded that whether or not our students enter below the national average, they show significant improvement in content knowledge as a result of this course sequence. STEM readiness scores for this cohort suggest that only 35% of the class was "ready" for Chem 131.

Demonstrate an understanding of the biological characteristics of each of the major kingdoms (Departmental Outcome F)	1) Mean score no lower than 0.5σ below national mean and no individual score lower than 1.5σ below the national mean on the ETS biology exam Organismal Sub-score.	1) Average Organismal sub-score is 58.8 ($+0.50\sigma$). No individuals failed to meet the -1.5σ criterion.	In light of the successful scores of several recent cohorts on the organismal sub-section of the ETS, the department has opted to not make any programmatic changes at this time based on this instrument. Individuals missing the criterion of -1.5σ on other sub-sections or even as composite scores are a concern for us, but legitimate reasons for individual students missing the cutoff (e.g., illness, test anxiety) do exist. The institutional cohort averages on this section are some of the highest and represent strengths of the department's biology programs.
Demonstrate an understanding of the fundamental concepts of molecular biology and genetics (Departmental Outcome G).	1) Mean score no lower than 0.5σ below national mean and no individual score lower than 1.5σ below the national mean on the ETS biology exam Molecular Biology and Genetics sub-scores.	1) Average Molecular Biology/Genetics sub-score is 54.3 ($+0.06\sigma$). One individual failed to meet the -1.50σ criterion (-1.95σ).	The average sub-score has increased significantly from last year's value giving strong evidence that last year's score (lowest since 2009) was anomalous. This year, the cohort average meets the departmental standard of -0.5σ. Nevertheless, the fact that 1 student failed to meet the -1.5σ criterion is unsettling. The department has had multiple, at-length conversations regarding students who successfully complete the curriculum and manage to miss minimum scores on standardized tests at graduation. Last year's report stated that "Departmental action is anticipated in some form by the next report (i.e., setting minimum grades for specific courses and/or limiting the number of course repeats might prevent this from recurring)." This has proven to be more difficult than anticipated. Although a minimum grade (C–) in Biol 147 is now a requirement for admission into Biol 254, this might not significantly impact performance in Biol 372 and Biol 375 content. Further conversation and potential action is likely warranted, and the department has agreed to continue this conversation.

Demonstrate an understanding of the various factors that impact biological populations (Departmental Outcome H).	1) Mean score no lower than 0.5σ below national mean and no individual score lower than 1.5σ below the national mean on the ETS biology exam Population Biology/Evolution/Ecology sub-score.	1) Average Population Biology/Evolution/Ecology sub-score is 52.5 (+0.09σ). All individuals met the -1.5σ criterion.	In light of the successful scores of several recent cohorts on the population biology/evolution/ecology sub-section, the department has opted to not make any programmatic changes at this time. Individuals missing the criterion of –1.5σ on other sub-sections or even as composite scores are a concern for us, but legitimate reasons for individual students missing the cutoff (e.g., illness, test anxiety) do exist. The institutional cohort averages on this section are some of the highest and represent strengths of the department's biology programs.
Demonstrate an ability to properly relate biological structure and function (Departmental Outcome I).	1) Mean score no lower than 0.5σ below national mean and no individual score lower than 1.5σ below the national mean on the ETS biology exam Cell Biology sub-score.	1) Average Cell Biology sub-score is 50.9 (–0.12σ). Two individuals failed to meet the –1.5σ criterion.	This sub-section of the ETS has historically been our lowest and this is true again this year. For this reason, a curricular change was proposed and passed by the full faculty that added one credit hour to the introductory Cell Biology course. This year represents only the third year that this curricular change would be expected to have any bearing on assessment scores of graduating seniors. Several years will be required, though, before the results could approach statistical significance. Furthermore, two students who completed an entire Malone biology curriculum missed the criterion of –1.5σ this year. Last year's report stated that "Departmental action is anticipated in some form by the next report (i.e., setting minimum grades for specific courses and/or limiting the number of course repeats might prevent this from recurring)." The department has since implemented a minimum grade of C– in Biol 147 as a threshold for admission into Biol 254. The department is content, at the moment, to see if this implemented change has the desired impact on the issue of the occasional poor student completing the program.

Demonstrate the capability of analyzing and reporting empirical data from the biological sciences (Departmental Outcome K).	Instrument has been dropped in favor of a newer one that has yet to be developed.	NO DATA	Previous reports have indicated that our department has been having a long and rather continuous conversation about the need to implement a research methods course. This course was developed and approved by the department and full faculty. This course ran for the first time in Fall 2016. The exact nature of the assessment instrument is still in flux, but the department has completed the most difficult step in addressing this shortfall. The instructor of this course has indicated that a specific instrument designed to address this Program Intended Learning Outcome is possible, and several instruments have been deployed within the course. To date, however, a departmental assessment addressing K is still in flux. The instrument should be in place with first data collection by Fall 2020.
Demonstrate the level of content mastery required for potential successful performance in graduate school biology programs or professional schools (Departmental Outcome N).	1) Mean score no lower than 0.5σ below national mean and no individual score lower than 1.5σ below the national mean on the ETS biology exam composite score. 2) Mean score no lower than 31/50 and no individual score lower than 24/50 on the departmental biology Post-Test (A&P questions excluded).	1) Average ETS composite score is 155.5 (+0.21σ). Every student met the –1.50σ criterion. 2) Mean score on in-house Biology post-test (50 question) is 33.65. All individuals exceeded the minimum score of 24 (lowest score was 25).	1) As has been the case for several years, the average ETS composite score has been meeting the departmental standard. Occasionally, an individual student fails to meet the minimum score, but this year all students met the standard. Two recent changes were implemented in response to this type of shortfall (minimum of C– in Biol 147 as prereq for Biol 254 and adding an extra hour to Biol 144). No further changes are warranted at this time. 2) The lowest score of 25 this year on the In-House Biology post-test is sufficient.