Biology Department Assessment Plan 2016-17

Nationally the conversation around biology education has been shaped by the Vision and Change in Undergraduate Biology (V&C) (2011) initiative backed by the NIH, NSF, USDA, AAAS and HHMI. V&C outlines core concepts and competencies very similar to our current biology department learning outcomes. Our department has discussed and is in the process of formally adopting updated biology learning outcomes that are directly aligned with V&C. By adopting the V&C learning outcomes we can make use of validated assessment instruments developed and tested by biology education researchers. The instruments are part of a NSF-funded BioMAPS (Biology-Measuring Achievement and Progression in Science) multi-institutional collaborative to develop V&C core concepts aligned assessments in different biology content areas (molecular biology, general biology, ecology and evolution, and physiology). The use of validated and broadly used assessment items will allow us to more rigorously evaluate our program, compare our program to other programs that are aligned to V&C, and meaningfully measure student outcomes in response to changes in the curriculum (e.g., proposed quantitative literacy initiative, Learning Biology). These instruments are designed to be sensitive to a range of student achievement levels and we expect these to be challenging assessments to students (to reduce the potential for ceiling effect in high achieving students). Based on their involvement with national V&C discussions, northwest biology faculty associations, and biology education research experience, Elly Vandegrift and Nicola Barber are spearheading the department assessment efforts and connections to national assessment initiatives.

For our 2016-17 assessment plan the Biology Department will

1. Formally adopt learning outcomes aligned with Vision and Change core concepts and competencies.
2. Elly Vandegrift and Nicola Barber will administer the Molecular Biology Capstone Assessment (MBCA) (Couch & Knight, 2015; Couch, Wood, & Knight, 2015) as an online qualtrics survey assessment administered to biology department seniors in Spring 2017. This assessment is designed to be administered near the end of a student's undergraduate career and online administration has been shown be as effective as in class. By administering online we can reach a greater number of students who are completing different coursework in their final academic quarter. Data will be automatically scored for students who complete the survey.
3. We will talk about the results at a biology faculty meeting and use the results to guide conversations about any changes to curriculum we may want to address.
4. The UO Biology Department is an affiliate member of NW PULSE (Partnership for Undergraduate Life Sciences Education), and results will be shared at the annual cohort meeting.

For our 2017-18 assessment plan we will

1. Administer the BioMAPS General Biology assessment for student in Bio 214 the fourth course in the Bio 211-214 introductory majors sequence and in Bio 283 the final course of the honors biology majors sequence. This online qualtrics assessment is designed to

measure ecology, physiology, and cellular biology on a more broad scale consistent with the coursework we anticipate students would have completed.

2. We will talk about the results at a biology faculty meeting and use the results to guide conversations about any changes to curriculum we may want to address.

Vision and Change core competencies

1. Ability to apply the process of science: Biology is evidence based and grounded in the formal practices of observation, experimentation, and hypothesis testing.
2. Ability to use quantitative reasoning: Biology relies on applications of quantitative analysis and mathematical reasoning.
3. Ability to use modeling and simulation: Biology focuses on the study of complex systems.
4. Ability to tap into the interdisciplinary nature of science: Biology is an interdisciplinary science.
5. Ability to communicate and collaborate with other disciplines: Biology is a collaborative scientific discipline.
6. Ability to understand the relationship between science and society: Biology is conducted in a societal context.

Vision and Change core concepts

1. Evolution: The diversity of life evolved over time by processes of mutation, selection, and genetic change.
2. Structure and function: Basic units of structure define the function of all living things.
3. Information flow, exchange, and storage: The growth and behavior of organisms are activated through the expression of genetic information in context.
4. Pathways and transformations of energy and matter: Biological systems grow and change by processes based on chemical transformation pathways and are governed by the laws of thermodynamics.
5. Systems: Living systems are interconnected and interacting.

References:

American Association for the Advancement of Science (AAAS). (2011). Vision and change in undergraduate biology education: A call to action, final report. Washington DC. http://visionandchange.org/files/2013/11/aaas-VISchange-web1113.pdf

BioMAPS https://www.nsf.gov/awardsearch/showAward?AWD_ID=1322556

Brownell, S. E., Freeman, S., Wenderoth, M. P., & Crowe, A. J. (2014). BioCore Guide: a tool for interpreting the core concepts of Vision and Change for biology majors. *CBE-Life Sciences Education*, *13*(2), 200-211. http://www.lifescied.org/content/13/2/200.full

Couch, B. A., & Knight, J. K. (2015). A Comparison of Two Low-Stakes Methods for Administering a Program-Level Biology Concept Assessment. *Journal of microbiology & biology education*, *16*(2), 178. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4690558/

Couch, B. A., Wood, W. B., & Knight, J. K. (2015). The Molecular Biology Capstone Assessment: a concept assessment for upper-division molecular biology students. *CBE-Life Sciences Education*, *14*(1), ar10. http://www.lifescied.org/content/14/1/ar10.full.pdf+html