Biology Department
Unit-Level Assessment Liaison Report
Spring 2018

Liaison Project Start Date: Spring Semester/2018
Liaison Report prepared by Aigerim Bizhanova

I. Department Buy-In and Outcome Definition

At the start of the Spring 2018 semester, I stepped back into the role of unit-level assessment liaison after Professor Bara Sarraj served in the position for the previous two semesters. At the same time, under the initiative of Professor Yev Lapik, the Biology department decided to form our own departmental Assessment committee, which currently consists of four full-time and one part-time faculty. After consultation with the members of the Biology assessment committee, we decided to continue unit-level assessment work in BIO 121, Introductory Biology for science majors.

Biology 121 is a general biology course with a focus on cellular and molecular biology. This course has the highest number of sections and serves as the pre-requisite for Biology 122 (Biology II), Biology 209 (Biochemistry), Biology 226 and 227 (Human Structure function I and II), Biology 250 (Introduction to Molecular Biology), and Biology 251 (Molecular Biology I). The course satisfies the General Education Life Sciences requirement for Biology majors and non-majors and is an Illinois Articulation Initiative (IAI) transferable course.

Following discussion with the members of the biology assessment committee, a recommendation was made to focus only on certain student learning outcomes with the goal to design a survey consisting of 15-20 questions due to the concern that any assessment that takes students more than 20 minutes to complete may affect their answering effectiveness and may interfere with instructors' class time. As a result, twenty core concepts were chosen based on a survey that was designed and administered by Professor Lapik to all full-time and part-time biology faculty during her sabbatical in the Fall of 2017. Professor Lapik's survey asked faculty to identify core concepts that are emphasized, covered, marginally covered, or not covered in their biology

courses. All of the selected core concepts for the Spring 2018 assessment were those that had either been emphasized or covered by all ten faculty that completed the Fall 2017 survey.

All twenty core concepts were closely aligned with the student learning outcomes of BIO 121, focusing on the following fundamental topics: basic principles of atomic structure, chemical bonds, organic macromolecules, cellular organization, major metabolic pathways, enzyme function, flow of genetic information, mutations and their role in cancer.

The following were the student learning outcomes that were selected:

- Recognize dependent, independent and controlled variables in an experiment
- Summarize the basics of atomic structure
- Recognize and predict molecules or parts of molecules that are hydrophobic or hydrophilic
- Distinguish between three main types of chemical bonds: covalent, ionic and hydrogen
- Compare and contrast 4 classes of biological molecules (carbohydrates, lipids, proteins, nucleic acids)
- Compare the structural hallmarks of bacterial (prokaryotic) cells and eukaryotic cells
- Differentiate among different types of transport across plasma membrane
- Explain the principles of enzyme function
- Distinguish and compare the processes by which organisms fuel growth and cellular activities (cellular respiration and photosynthesis)
- Explain what is DNA replication and when it happens
- Discuss what happens when cell cycle control mechanism is damaged
- Explain how mistakes in cell division can lead to cancer and chromosomal abnormalities
- Diagram the flow of genetic information in cell
- Compare and contrast the outcomes of cell division via mitosis and meiosis
- Recognize that DNA sequences have a meaning
- Explain what mutations are and how they affect genetic code

Most of the questions in the pilot assessment gear towards each SLO. Few questions of the assessment overlap with several SLOs.

II. Assessment Research and Design

Once the twenty core concepts were selected and approved by the members of Biology assessment committee, our department unit-level assessment liaison (Aigerim Bizhanova) was given a task to design a pilot assessment tool.

After reviewing current educational research literature on assessment of student understanding of fundamental concepts in Introductory Cell and Molecular Biology (1-2), student misconceptions in introductory biology (3), and publishers' test bank, a pilot assessment survey was designed. The pilot assessment survey consists of twenty multiple-choice questions. Some multiple-choice questions were adapted from the research literature and publishers' test banks, while some questions were designed from scratch.

III. Pilot Assessment Tools and Processes

The draft of the pilot assessment survey was shared with all of the members of Biology Assessment committee. Several member of the committee offered their feedback and suggested revisions of some questions in the survey to minimize possible confusion among students. All of the comments and suggestions were incorporated into the assessment tool. After several rounds of revisions, the survey was finalized and sent to the reprographics facility during week 14.

IV. Administer Specific Assessment

The pilot assessment will be administered to 5 sections of Biology 121 before the end of Spring 2016 semester (during weeks 15 and 16). Instructions on how to administer the pilot assessment along with an explanation about why it is important were given to all faculty who volunteered their class sections. Students were also given instructions on how to complete the pilot assessment and an explanation about why they are taking the assessment. In addition to instructions, students were provided with a scantron sheet. The time allotted for taking the pilot assessment is 20 minutes.

V. Data Analysis

We are hoping to obtain a good sample size (approximately 120 students) in order to perform data analysis using the analytics tool OpenBook. This will hopefully give us some useful insights to adjust the assessment tool and perform a full-scale assessment with a bigger sample size in the coming Fall 2018 semester.

VI. Supporting Evidence-Based Change (Use of Findings)

The results of the pilot assessment will be presented to the faculty of our department in the fall of 2018 in order to receive feedback and suggestions. Based on what we learn from the data about student learning and based on the feedback/suggestions given by the faculty, the next steps will be determined.

Success Factors

This semester is the first semester that the Biology department had formed our own assessment committee. Therefore, it is an exciting opportunity for our department to more deeply engage in assessing how our students learn. Currently, our departmental assessment committee consists of four full-time and one part-time biology faculty. Our committee had already met 3 times this semester and discussed several ideas related to assessment of student learning in the department. The committee is planning to work on creating our Committee's charge and deliverables for the Fall 2018 semester. Thanks to several meetings we had to talk about assessment, more faculty are now aware about the way the assessment process is done at Harold Washington College. There is an increasing level of interest in assessment among the faculty in the department, which has led to many engaging and meaningful conversations about what we want our students to learn about biology.

Recommendations

Recommendations for our next steps will be given based on the analysis of the results from the pilot assessment and upcoming faculty discussions. The results of the pilot assessment analysis will be presented to all biology faculty at the first department meeting in fall 2018. It is recommended that for the full-scale assessment in fall 2018, students are given an online assessment survey created using Google Doc, with the goal to not take time from regular

instructional time and to make scoring and analysis of the assessment results easier and more efficient.

References

1. Shi J. *et al*. (2010). A diagnostic assessment for introductory molecular and cell biology. *CBE Life Sci Educ* 9: 453-61.
2. Wilson C. *et al*. (20006). Assessing Students' Ability to Trace Matter in Dynamic Systems in Cell Biology. *CBE Life Sci Educ* 5: 323-331.
3. Queloz A. et al. (2017). Diagnostic of students' misconceptions using the Biological Concepts Instrument (BCI): A method for conducting an educational needs assessment. *PLOS One* 12(5): e0176906.