BIOLOGY DEPARTMENT

Unit-Level Assessment Liaison Report

Spring 2016

Liaison Project Start Date: Spring 2016

Liaison Report prepared by Aigerim Bizhanova

Department Buy-In and Outcome Definition

At the start of the Spring 2016 semester, our department had a meeting to decide what learning outcomes we would like to assess in the classes we currently offer. Since our department offers a wide range of courses across biological disciplines, we decided to start first with assessing student learning in our two most popular courses based on student enrollment, Introductory Biology for Science majors (Biology 121) and General Education Biology (Biology 114).

Biology 121 is a general biology course for science majors with a focus on cellular and molecular biology. Biology 114 is a basic biology course designed for non-science majors. Both courses satisfy the General Education Life Sciences requirement for Biology majors and non-majors and are Illinois Articulation Initiative (IAI)-transferrable courses.

After consulting with the faculty in our department, we decided to assess student understanding of cellular organization of living things. Specifically, we would like to assess whether students are able to identify the main cellular components (organelles) and describe their functions. Many biological disciplines such as molecular and cellular biology, genetics, microbiology, human anatomy, and physiology build upon understanding of the main components of a cell and their functions. In addition to being one of the student learning outcomes for Biology 121 and Biology 114, identification and description of cellular organelles is also listed as one of the biology program-level outcomes at many two- and four-year schools across the country.

Assessment Research and Design

Biology 121 is a 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). Our department came to consensus that one of the main learning goals in Biology 121 is understanding the main components of a cell and their functional significance. In order to assess students'

understanding of cells and their organization, the following learning outcomes from Biology 121 and Biology 114 were selected:

- Identify the main cellular organelles
- Describe their functions in a cell

Once the learning outcomes were selected, our department unit-level assessment liaison (Aigerim Bizhanova) was given a task to design a pilot assessment tool.

Pilot Assessment Tools and Processes

After reviewing assessment tools on cells and cellular organization, available on the website of the American Association for the Advancement of Science (AAAA) at http://assessment.aaas.org, a pilot assessment was designed. The pilot assessment is composed of several multiple-choice questions and a diagram of a cell (Appendix A). Some of the multiple-choice questions were taken from the AAAA website and modified to be aligned with the learning outcome. Other questions, including the cell diagram, were designed from scratch. The multiple choice questions ask students to identify organelles involved in various processes, such as protein production, metabolic function, transport, and storage and transmission of genetic information in a cell. The diagram of a cell asks students to identify main cellular components and match them with molecules that are associated with them.

The assessment rubric was designed to rate student performance on each question of the pilot assessment (Appendix B) The rubric was designed following discussion with the Vice-Chair of Unit-Level Assessment, Erica McCormack, and reviewing literature on rubric design.

Administer Specific Assessment

The pilot assessment will be administered to 4 sections of Biology 121 and 2 sections of Biology 114 before the end of Spring 2016 semester (during weeks 14 and 15). Instructions on how to administer the pilot assessment along with an explanation of 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 of why they are taking the assessment. The time allotted for taking the pilot assessment was 20 minutes.

Data Analysis

We are hoping to obtain a good sample size (approximately 115 students) in order to perform data analysis using the analytics tool OpenBook. This will hopefully give us some useful insights to adjust the tool and perform a full-scale assessment with a bigger sample size in the coming Fall 2016 semester.

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 2016 in order to receive feedback and suggestions. Based on the feedback/suggestions given by the faculty, the next steps will be determined.

Success Factors

This semester is the first semester that our department had a unit-level liaison. Therefore it is an exciting opportunity for our department to start assessing how our students learn. Thanks to several meetings we had in the department to talk about assessment, more faculty are now aware of 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 pilot assessment analysis will be presented to faculty at the first department meeting in fall 2016. It is recommended that for the full-scale assessment in fall 2016, students are provided scantron sheets to answer multiple-choice portion of the assessment. This will make scoring of the assessment results faster and efficient.

Appendix A: Pilot Assessment Tool

Choose the one alternative that best completes the statement or answers the question

1. What structure is responsible for making proteins for various cell functions?
A) Nucleus
B) Ribosome
C) Lysosome
D) Plasma membrane
E) Smooth endoplasmic reticulum

2. An organelle called the _____ provides a place for many proteins that are destined to be released from a cell, to fold into their 3-D shape.
A) nucleus
B) mitochondrion
C) Golgi apparatus
D) rough endoplasmic reticulum
E) smooth endoplasmic reticulum

3. The _____ receives macromolecules, modifies and sorts them, then sends them to their final destination.
A) nucleus
B) mitochondrion
C) Golgi apparatus
D) rough endoplasmic reticulum
E) smooth endoplasmic reticulum

4. An organelle called the _____ produces many types of lipids for various cell functions.
A) nucleus
B) mitochondrion
C) Golgi apparatus
D) rough endoplasmic reticulum
E) smooth endoplasmic reticulum

5. A _____ contains enzymes designed to break down macromolecules and food particles.
A) nucleus
B) lysosome
C) cytoskeleton
D) Golgi apparatus
E) smooth endoplasmic reticulum

6. The _____ is responsible for most of energy production in eukaryotic cells.
A) nucleus
B) mitochondrion
C) Golgi apparatus

D) rough endoplasmic reticulum
E) smooth endoplasmic reticulum

7. Which of the following is true about the nucleus?
A) it produces and stores lipids
B) it contains and protects DNA
C) It ships molecules to their final destination
D) All of the above
E) None of the above

8. Which process or processes occur in the nucleus?
A) transcription and translation of RNA
B) DNA replication and transcription
C) DNA replication, transcription, and translation
D) transcription
E) DNA replication

9. Which of the following statements is false about plasma membranes?
A) Plasma membranes serve as barriers
B) Plasma membranes are found in all cells
C) All molecules easily pass through the plasma membrane
D) A plasma membrane contains two phospholipid bilayers
E) None of the above

10. Below is a picture of an animal cell. Identify the cellular structures for A, B and C. Next match up the cellular structure with the macromolecule or molecule associated with that structure (i.e this molecule or macromolecule either makes up each cellular structure or is produced there).

Cellular structure A: _____

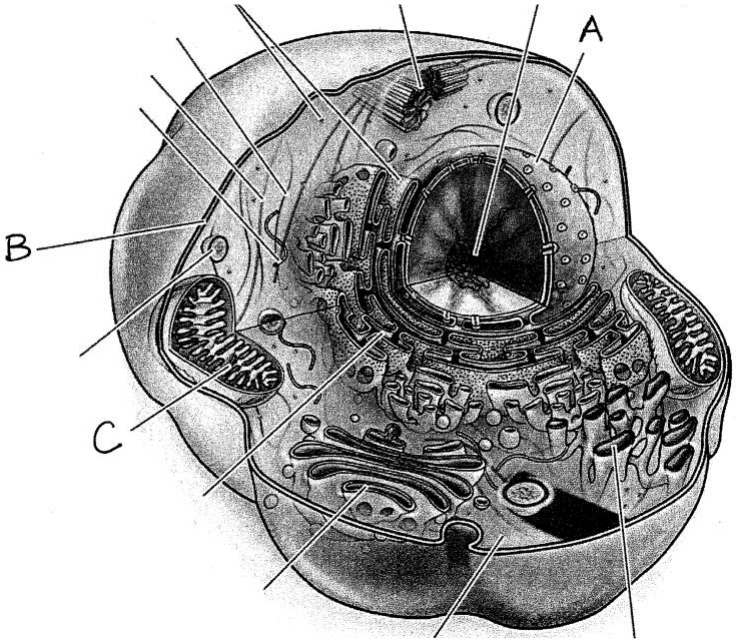
Associated molecule for A: _____

Cellular structure B: _____

Associated molecule for B: _____

Cellular structure C: _____

Associated molecule for C: _____



Appendix B: Scoring Rubric

CATEGORY	Meets outcome	Emerging skills		Does not meet outcome
	3 pts	2 pts	1 pt	0 pts
Protein production and processing **(questions #1, 2, 3)**	Student provides the correct functions for all three organelles involved in protein production and processing	Student provides the correct functions for two of the three organelles involved in protein production and processing	Student provides the correct function for one of the three organelles involved in protein production and processing	Student fails to provide the correct functions for any of the three organelles involved in protein production and processing
Metabolic functions **(questions #4, 5, 6)**	Student correctly describes functions of all three organelles involved in metabolic functions of a cell	Student correctly describes functions of two of the three organelles involved in metabolic functions of a cell	Student correctly describes function of one of the three organelles involved in metabolic functions of a cell	Students fails to correctly describe functions of any of the three organelles involved in metabolic functions of a cell
Nucleus and its functions **(questions # 7, 8)**	Student correctly identifies the function of nucleus and names two processes (DNA replication and transcription) that happen in nucleus	Student correctly identifies the function of nucleus and names one of the two processes that happen in nucleus	Student correctly identifies the function of nucleus and/or correctly names one of the two processes that happen in nucleus	Students fails to identify the function of nucleus and describe any of the two processes that happen in nucleus
Structure and functions of plasma membrane **(question #9)**	Student correctly describes the structure, function of plasma membrane and the presence of plasma membrane in all cells.	Student correctly describes the structure and function of plasma membrane but fails to identify the presence of plasma membrane in all cells	Student correctly describes the structure or function or the presence of plasma membrane in all cells	Student fails to correctly describe the structure, function of plasma membrane and the presence of plasma membrane in all cells
Identifying organelles shown on the cell diagram and describing their composition (question #10, cell diagram)	Student correctly identifies all three organelles shown on the cell diagram and accurately describes composition of all three organelles	Student correctly identifies 2 of the three organelles shown on the cell diagram and accurately describes composition of two of the three organelles	Student correctly identifies one or two of the three organelles shown on the cell diagram and/or accurately describes composition of one or two of the three organelles	Student fails to correctly identify any of the three organelles shown on the cell diagram and accurately describe composition of any of the three organelles