**BENCHMARK ASSESSMENT REPORTING FORM**

**(To be Completed by Faculty)**

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| **Program or Course: BIO181, General Biology** |
| **Date: 1/29/2021** |
| **Number of Student Participants: 126**  |
| **Number of Faculty/Staff Participants: about 10** |
| **Name of person completing report: Sunjung Park** |
| **Assessment Reporting Form:** This report is to show that assessment is occurring and that the results are being used to make changes to improve student learning. The assessment being reported could be an assessment of a Program Learning Outcome (PLO) or a Measurable Student Level Outcome (MSLO). Each program should be assessing and gathering data for at least two PLOs OR two MSLOs that contain CSLOs each year.  |
| **1. What PLOs and/or MSLOs and CSLOs did you assess this year?** **We assessed 15 MSLOs and three CSLOs.****MSLO 1**. (Comprehension Level) Summarize the seven themes of life and provide an example for each.**MSLO 2**. (Application Level) Apply the scientific hypothesis based method and the qualitative science method whenstudying scientific questions.**MSLO 3**. (Application Level) Demonstrate safe and appropriate application of scientific laboratory and field techniques.**MSLO 4**. (Comprehension Level) Describe how basic chemistry concepts, including those of carbon, relate to biology.**MSLO 5**. (Analysis Level) Analyze and discuss the properties of water and describe how they are important to life.**MSLO 6**. (Evaluation Level) Explain the classes of biological molecules and their functions.**MSLO 7**. (Comprehension Level) Describe the basic cell structures and functions.**MSLO 8**. (Comprehension Level) Describe cell membrane structures and functions.**MSLO 9**. (Evaluation Level) Explain the basics of cell energetics and metabolism, including cell respiration and photosynthesis.**MSLO 10**. (Evaluation Level) Explain the processes of cellular communication.**MSLO 11**. (Comprehension Level) Describe the process and functions of cell divisions (both mitosis and meiosis).**MSLO 12**. (Application Level) Apply the principles of Mendelian genetics to solve basic genetics problems.**MSLO 13**. (Comprehension Level) Differentiate between sexlinked inheritance, linked genes, genomic imprinting, organelle genes, and abnormal chromosome structure/number.**MSLO 14**. (Evaluation Level) Explain the structure and replication of DNA, including the history of its discovery.**MSLO 15**. (Comprehension Level) Summarize the processes of transcription, translation, and basic gene expression regulation.**CSLO 2.** Integrative Knowledge – Identify, comprehend, apply and synthesize facts, concepts, theories and practices across broad and specialized knowledge areas.**CSLO 3.** Personal and Professional Skills – Demonstrate skills which enhance personal and professional development.**CSLO 4.** Reasoning Skills – Inquire and analyze to solve problems, draw conclusions or create innovative ideas.Table 1. 20 assessment questions matching to each MSLO and CSLO.

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| Question # | Question | MSLO | CSLO |
| 1 | *You are standing next to a giant saguaro cactus. Which of the following is not a unifying characteristic that you and the saguaro share?* | MSLO1 | CSLO2 &4 |
| 2 | *A medical scientist is designing an experiment to test the results of a new drug that she hypothesizes will greatly reduce and possibly eliminate the side effects of a new cancer treatment. If this experiment is set up correctly, it would be best to:*  | MSLO2 &3 | CSLO2 &4 |
| 3 | *Which of the following solutions has the highest concentration of hydrogen ions [H+]?* | MSLO4 | CSLO2 &4 |
| 4 | *Which of the following best explains why living organisms are composed of carbon-based (organic) molecules?* | MSLO4 | CSLO2 |
| 5 | *Which one of the following is not a property of water?* | MSLO5 | CSLO2 |
| 6 | *In addition to serving as structural components of organisms, are the work horses of life and allow cells to maintain their unique shapes move through their environment, speed up chemical reactions, alter metabolism, communicate, and transport substances through membranes.* | MSLO6 | CSLO2 &4 |
| 7 | *Sac-like organelles that contain powerful digestive enzymes which break down and recycle organic substance are known as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.* | MSLO7 | CSLO2 |
| 8 | *The organelle that breaks down glucose to make energy for the cell is\_\_\_\_\_\_\_\_\_\_.* | MSLO7 | CSLO2 |
| 9 | *Ions may passively cross a cell’s plasma membrane by \_\_\_\_\_.* | MSLO8 | CSLO2 |
| 10 | *Which event during cellular respiration directly produce the most ATP from a glucose?* | MSLO9 | CSLO2 |
| 11 | *Which of the following are products of the light reactions of photosynthesis that are utilized in the Calvin cycle?* | MSLO9 | CSLO2 |
| 12 | *Which of the following is correct step of cell signaling?* | MSLO10 | CSLO2 |
| 13 | *The nucleus of a particular parent diploid cell contains 40 total chromosomes. Select the answer that best describes each daughter nucleus after meiosis.* | MSLO11 | CSLO2 |
| 14 | *Eukaryotic somatic cells like cheek cells and bone cells divide by which process to produce two daughter cells?* | MSLO11 | CSLO2 |
| 15 | *Use the Punnett square in Figure 1 on page 5 and the following description to answer the question below.**In a particular plant species, dark green leaves is completely dominant over light green leaves and is controlled by a single gene locus with two alleles, D and d. If two heterozygous plants are crossed, which boxes (1, 2, 3, or 4) labeled in the Punnett Square correspond to offspring with dark leaves.*

|  |  |  |
| --- | --- | --- |
|  | D | d |
| D | 1 | 2 |
| d | 3 | 4 |

 | MSLO12 | CSLO2 &4 |
| 16 | *Why do X-linked disorders appear more frequently in human males that in females* | MSLO13 | CSLO2 &4 |
| 17 | *What is Karyotype?* | MSLO13 | CSLO2 |
| 18 | *Which one of the following terms best describes the separation of sister chromatids and the movement of these two chromosomes toward opposite poles of the cell?* | MSLO11 | CSLO2 |
| 19 | *Use the genetic code on next page to determine which amino acid sequence will be synthesized by a ribosome based on the following mRNA sequence:**5’ GCGUAUGUCUUCGUUAUCCUUGUGAC3’*D:\Faculty_CAC\Course assessment\BIO181\Codon chart.png | MSLO15 | CSLO2 &4 |
| 20 | *Which of the following best describes the general process behind DNA replication in living cells?* | MSLO14 | CSLO2 |

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| **2. Describe the assessment method used and criteria for successful achievement of student learning outcomes. (e.g., rubrics, licensing exam, internship, portfolio, exam, research paper, performance exam, EAC, etc.)****Describe the assessment method:** 20 assessment test questions of MSLO and CSLO had been prepared by BIO 181 full time faculties. All assessment questions had been proved by all full time faculties and adjunct faculties. There are easy learning objectives and difficult learning objectives. For easy learning objective, only one question of MSLO and CSLO is tested. For the difficult learning objective, two or more questions of MSLO and CSLO which have a variable depth of difficulties had been tested to find how well student understood the difficult learning objective. If more than 50% of student answered easy or intermediate questions correctly for the difficult learning objective, then it was concluded that students understood the learning objective. Assessment test was uploaded in the blackboard and students took an exam using the department laptop in the presence of proctor or in student learning center during the class for in-person class, spring 2019 and fall 2019. Students took the assessment test in the blackboard at home without proctor for online class at spring 2020. **Criteria of successful achievement of student learning outcomes** was if more than 50% of students answered question correctly, it is considered that students understood learning outcome |
| **3. How many students were proficient in the PLOs OR MSLOs and CSLOs and how many were not? What was determined as proficient? (i.e. 70% = proficient)** Table2. Percentage of the students answered each MSLO correctly.

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| --- | --- |
| MSLOs | % of students answer correctly |
| BIO181.MSLO.01 | 71.4 |
| BIO181.MSLO.02 | 63.5 |
| BIO181.MSLO.03 | 63.5 |
| BIO181.MSLO.05 | 60.1 |
| BIO181.MSLO.04 | 56.3 |
| BIO181.MSLO.06 | 64.3 |
| BIO181.MSLO.07 | 77.8 |
| **BIO181.MSLO.08** | **38.1** |
| **BIO181.MSLO.09** | **42.9** |
| BIO181.MSLO.10 | 77 |
| **BIO181.MSLO.11** | **47.6** |
| BIO181.MSLO.12 | 59.5 |
| BIO181.MSLO.13 | 61.1 |
| **BIO181.MSLO.14** | **42.9** |
| **BIO181.MSLO.15** | **26.9** |

**Data from the EAC shows how many students answered correctly per each MSLOs. BIO181 instructors determined 50% as a proficiency. Students were proficient in 10 among 15 MSLOs (67% of MSLOs) according to the table.****Students were not proficient in 5 MSLOs highlighted with red color. Those are** **MSLO 8**. (Comprehension Level) Describe cell membrane structures and functions.**MSLO 9**. (Comprehension Level) Cellular respiration.**MSLO 11**. (Comprehension Level) Cell reproduction. \*Student understood mitosis but didn’t understand Meiosis**MSLO 14**. (Evaluation Level) Explain the structure and replication of DNA, including the history of its discovery. \*Especially, student did not understand DNA replication process. **MSLO 15**. (Comprehension Level) Summarize the processes of transcription, translation, and basic gene expression regulation. \*Student did not understand transcription and translation.I am interested in knowing that how many students answered more than 18 questions (90%), 16 (80%), and 14 (70%) out of 20 total questions for overall not for each MSLO. In other words, I like to have a data of distribution of students on grade A, B and C. I will ask this data from EAC in the future. |
| **4. What changes/improvements were made or will be made in response to the outcomes of the assessment process?**One of the great data generated by EAC is that data is not only showing how many students answered correctly but also showing how many students choose wrong answer. From this data, we can find what is the choice student confused with correct choice and they ended up choose wrong choice if they did not know the learning outcome clearly. Data form the table 3 is giving us lots of information that 48% of students choose correct answer by understood cell membrane function but 43% which is huge number of students choose incorrect answer which is “Simple diffusion through the phospholipid bilayer”. However, this choice is also the right function of the cell membrane. Students choose wrong answer understood function of the cell membrane but they didn’t know the more details of cell membrane function. Like this, we will find what are the wrong choices where many students fell into for that 5 MSLOs (table 2). This will be good information to teach emphasis on student’s weakness on that particular MSLO.Table3. Data from EAC shows break down of number of students choose correct answer and wrong answers. Suggestions to improve the proficiency of the students for the 5 MSLOs from table2 in which less than 50% of students answered incorrectly for Fall 2021.1. Instructors will be asked to spend more time to explain 5 MSLOs which lots of students fail to choose correct answer.
2. All instructors will post short video clips from youtube or khan academy in blackboard for those 5 MSLOs.
3. Instructors will be asked to test similar (not same as assessment test) questions in their quizzes or exams for those 5 MSLO.
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***Feel free to attach your PLOs OR MSLOs and CSLOs and indicate which were assessed***