Course-Level Assessment Project
Final Report

To complete the Final Report, type your responses to the prompts below. Share a copy of the document with your supervisor and the Associate Provost of Assessment and Institutional Research.

Faculty Name(s):	**Samala Lewis**
Division/Department:	**Sciences-Biology**
Course Assessed:	**Biology 101**

Step 1. Define

a. *Explain the purpose or rationale for assessing the selected course.*

This is a scheduled and required assessment for the 2020-2021 Biology 101 course.

b. *Identify which course objective(s) were assessed. Briefly explain why you selected these course objectives for assessment.*
c. *Identify to which program goal(s) selected course objective(s) align.*

All course objectives were evaluated.
1. Relate chemical and physical structures to cellular processes, including the maintenance of homeostasis and cell signaling (PG1, PG2, PG3, PG4, PG5 GE1, GE2, GE3, GE4, GE5, GE6)
2. Compare and contrast essential metabolic pathways, including energy flow and organic molecule conversions (PG1, PG2, PG3, PG4, PG5 GE1, GE2, GE3, GE4, GE5, GE6)
3. Explain the cell cycle, and the cell division processes of mitosis and meiosis, as they apply to growth, repair, maintenance, and reproduction (PG1, PG2, PG3, PG4, PG5 GE1, GE2, GE3, GE5, GE6)
4. Explain the central dogma of molecular biology and the basic concepts of gene expression in prokaryotes and eukaryotes (PG1, PG2, PG3, PG4, PG5 GE1, GE2, GE3, GE5, GE6)
5. Describe the basic principles of genetics and relate these to mechanisms of inheritance (PG1, PG2, PG3, PG4, PG5 GE1, GE2, GE3, GE5, GE6)
6. Explain the development of biotechnology in the context of ethical considerations, current applications, and global societal needs. (PG1, PG2, PG3, PG4, PG5 GE1, GE2, GE3, GE5, GE6)
7. Explain evolution as the unifying thread in biology (PG1, PG2, PG3, PG4, PG5 GE1, GE2, GE3, GE5, GE6)
8. Use the scientific process to investigate biological questions and make informed decisions. (PG1, PG2, PG3, PG4, PG5 GE1, GE2, GE3, GE4, GE5, GE6)
9. Research and present information on selected topics using various communication tools. (PG1, PG2, PG3, PG4, PG5 GE1, GE2, GE3, GE4, GE5, GE6) (GE1 PG1, PG2, PG3).

Step 2. Design

    a. *Describe the instrument (project/assignment) used to assess identified course objective(s).*

    Final Exam (100 multiple choice items) was scored to assess course objectives 1-8.

    b. *What benchmarks and/or controls were established?*

    Benchmark 1. Exam Score: The benchmark for meeting the standard was that 70% of students must score ≥ 70 on the final exam.

    Benchmark 2. Objective and Item Analysis: The benchmark is that students must score ≥ 70% on each objective. For Sp2021, the benchmark was modified and changed to ≥ 65% to meet the benchmark. This modification was to normalize final exam scores between students taking the traditional 15-week course and students taking a 7-week accelerated course. Most of the student scores analyzed in Spring 2021 were from students taking a novel 7 week accelerated Biology 101 course.

    Benchmark 3. Signature Assignment Scores: The benchmark is that students must score ≥ 70% on the Signature Assignment.

    c. *Explain how the assessment instrument was externally reviewed and validated.*

    The Biology 101 Final Exam was designed, aligned with program and general education goals, and externally reviewed by Dr. Stacy Zell, a full-time instructor of BIOL-100 and BIOL-105.

    The Signature Assignment was designed by a former instructor of CCC and reviewed and approved by the General Education Committee.

Step 3. Implement

    a. *Explain how the assessment was implemented.*

    The BIOL-101 Final Exam (100 multiple choice items) was given in an online, digital format and scored via the Canvas LMS.

    The Signature Assignment was a paper with a lab report and reflection component based on an Osmosis lab and submitted electronically through the Canvas LMS.

    b. *Did any unexpected challenges arise in implementing the assessment?*

    The process went according to plan, but a modification was needed in order to normalize student overall final exam scores from the 15 week and 7 week accelerated BIOL-101 course.

Step 4. Analyze

 a. *Explain the data that was collected and how the data was analyzed*.

  The Final Exam (100 multiple choice items) results and Signature Assignments scores were analyzed via Microsoft Excel.

 b. *To what degree did students meet the established benchmarks?*

*Benchmark 1. F2020-Exam Score: **Exceeds Standards**.* The benchmark for meeting the standard was that 70% of students must score ≥ 70 on the final exam. Data shows that the course exceeds the benchmark, as 82% (14) of students scored ≥ 70 on the final exam. Seventeen exams were scored, with scores ranging from 45- 97. The average score was 82, with a median of 86 and a mode of 91. The distribution of scores shows that 7 (41%) students scored A (90-100), 4 (24%) students scored B (80-89), 3 (18%) students scored C (70-79), 2 (12%) students scored a D (60-60), and 1 (6%) student scored an F (< 60). 18% (3) of students did not meet the standard (Figure 1). However, out of that 18% that did not meet the standard, two (12%) students did pass the exam with a grade of D (60-69), and only one (5%) student failed the exam with a score <60. It is important to note that the student who failed the exam did not complete the course (Table 1; Figure 1; Figure 2).

Table 1

F2020-Final Exam Scores

Descriptive Statistics	
Mean	82.47059
Standard Error	3.1948
Median	86
Mode	91
Standard Deviation	13.1725
Sample Variance	173.5147
Kurtosis	2.941108
Skewness	-1.56086
Range	52
Minimum	45
Maximum	97
Sum	1402
Count	17

Figure 1

Fall 2020 Percentage Final Exam Scores Meeting Standard

18% / 82%

Meets Standards (≥70)
Does not meet standards (≤70)

Figure 2

F2020 Final Exam Score Distribution

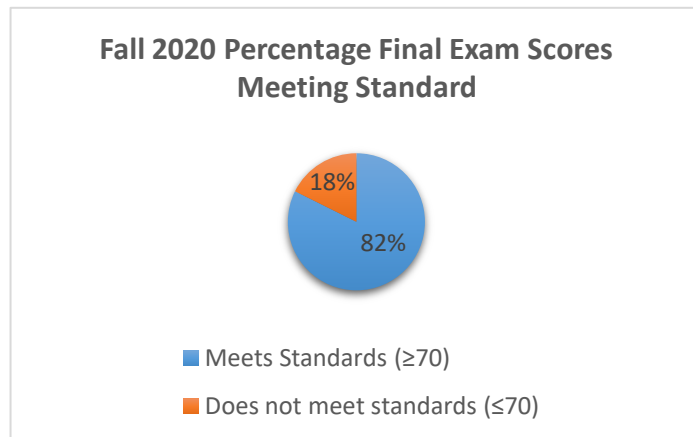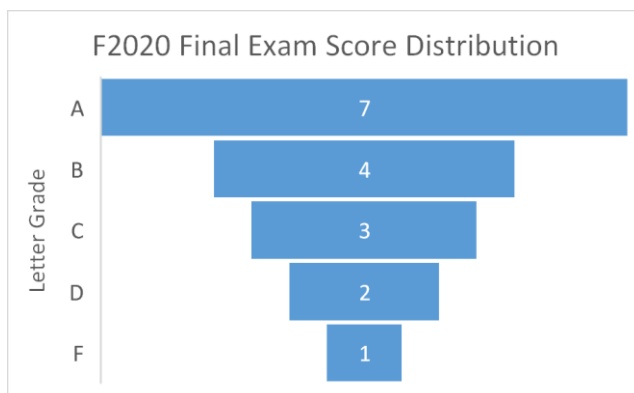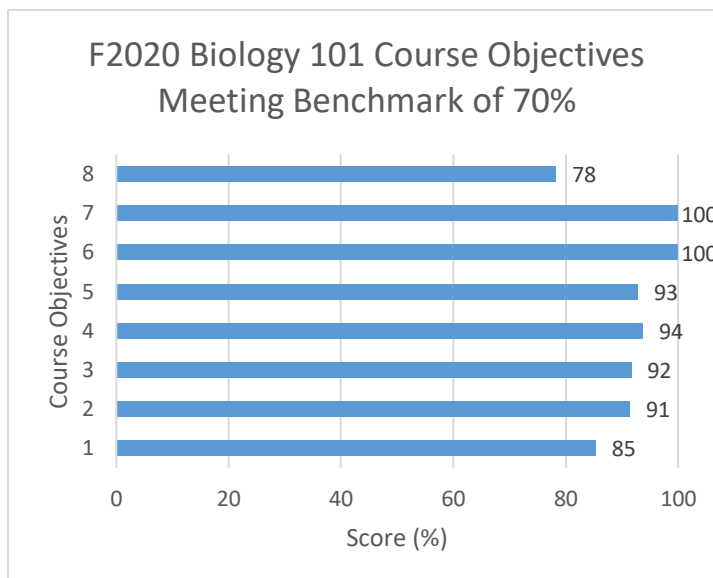| Letter Grade	
A	7
B	4
C	3
D	2
F	1

*Benchmark 2. F2020-Objective and Item Analysis: **Exceeds Standards**.* The benchmark is that students must score ≥ 70% on each objective. Data shows that the course exceeds the benchmark for all standards with scores ranging from 78-100% scoring ≥ 70% on each objective. The final exam consists of 100 multiple choice items aligned with Biology 101 course objectives 1-8. Objective 1 was aligned with questions 3, 7-8, 10-23, 26-33, 35-41, 45-47, 51. Students scored greater than 70 on 85% of Objective 1 items. Objective 2 was aligned with questions 18, 20, 27-37, 40-45, 47-61. Students scored greater than 70 on 91% of Objective 2 items. Objective 3 was aligned with questions 63-74. Students scored greater than 70 on 92% of Objective 3 items. Objective 4 was aligned with questions 64, 73, 81-94. Students scored greater than 70 on 94% of Objective 4 items. Objective 5 align with questions 64, 72-73, 75-99. Students scored greater than 70 on 93% of Objective 5 items. Objective 6 aligns with questions 95-96, 100. Students scored greater than 70 on 100% of Objective 6 items. Objective 7 aligns with questions 2-4, 72-73. Students scored greater than 70 on 100% of Objective 7 items. Objective 8 aligns with questions 1-6, 9, 11, 13-18, 20-25, 32-34, 77, 94. Students scored greater than 70 on 78% of Objective 8 items (Table 2, Figure 3).

Table 2

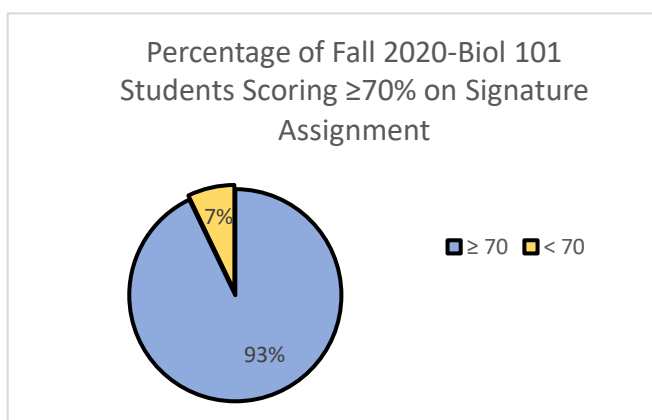*Average F2020 Scores on*

Course Objectives

Objectives	%≥70	%<70
1	85	12
2	91	9
3	92	8
4	94	6
5	93	7
6	100	0
7	100	0
8	78	22

Figure 3

F2020 Biology 101 Course Objectives Meeting Benchmark of 70%

Benchmark 3 Signature Assignment Scores. ***Exceeds Standards****.* The benchmark is that students must score ≥ 70% on the Signature Assignment. Data shows that the course exceeds standards for Fall 2020 as, 93% of students scored ≥ 70 on the Signature Assignment. Of the 14 assignments scored, the scores ranged from 65-98. The average score was 85, with the median and mode at 90. Of the 14 assignments scored, 8 students scored A (90-100), 2 students scored B (80-89), 3 students scored C (70-79), and 1 student scored a D (60-60). 13 (93%) students scored higher than 70 on the assignment, exceeding the benchmark of 70%. 1 (7%) student did not meet the benchmark of 70% as the student had a score of 65, however this student did not complete the reflection portion of the assignment which brought the score down by 20 potential points (Table 3; Figure 4).

Table 3

Figure 4

F2020 Signature Assignment Scores

FA2020 Descriptive Statistics	
Mean	85
Standard Error	2.805246
Median	90
Mode	90
Standard Deviation	10.49627
Sample Variance	110.1717
Kurtosis	-1.00007
Skewness	-0.51857
Range	33
Minimum	65
Maximum	98
Sum	1183.5
Count	14

Percentage of Fall 2020-Biol 101 Students Scoring ≥70% on Signature Assignment

≥ 70   < 70
7%
93%

c. *Consider intention of learning activity and assessment as compared to results.*

The results indicate that the intention of this activity/assessment meets standards aligned with program and general education goals.

Step 5. Modify/Maintain
a. *Based on analysis of data, describe changes made to the course and/or course materials.*

Pedagogical Modification 1: Although data for Objective 8 shows that the course exceeds standards, this objective had the lowest score with 78% of student scoring ≥70 on objective items. 22% of students scored <70 on these items 6 (47%), 21 (65%), 25 (47%), 33 (53%), and 34 (65%). After meeting with instructors during Spring 2021 preview week to discuss the results for objective 8, a multiple choice assignment was designed to help students think critically about science content related to objective 8.

The goal of this assignment is to increase the percentage of students scoring ≥ 70 on the items for this objective and decrease the percentage if students scoring < 70 on items 6, 21, 25, 33, and 34.

Pedagogical Modification 2: The Signature Assignment was modified to include a deeper analysis of data, requiring both qualitative and quantitative data. The Signature assignment was also modified to include a research question and hypothesis section which was not a previous requirement of the Signature Assignment, but a major component of any well written scientific paper.

b. *Summarize the results of implementing changes, re-administering the assessment, and collecting and analyzing new data.*

Benchmark 1. Sp2021-Exam Score: Exceeds Standards. The benchmark for meeting the standard was that 70% of students must score ≥ 70 on the final exam. Data shows that the course did not meet standards for Sp2021 as, as 69% of students scored ≥ 70 on the final exam. When the benchmark was normalized to ≥ 65, the benchmark exceeded standards as 92% of the students scored ≥ 65 on the final exam. Thirteen exams were scored, with scores ranging from 62- 96. The average score was 81, with a median of 84. Courses were not quite comparable in Sp2021 because some students took an accelerated 7-week course and others took a 5- week course. For this reason, the Sp2021 benchmark was modified and changed to ≥ 65%. This modification was to normalize final exam scores between students taking the traditional 15-week course and students taking a 7-week accelerated course. Most of the student scores analyzed in Spring 2021 were from students taking a novel 7 week accelerated Biology 101 course (Table 4; Figure 5; Figure 6).

Table 4

Sp2021 Final Exam Scores-Descriptive Statistics

	All Sp2021	*7 Week*	*15 Week*
Mean	80.69231	80.5	81
Standard Error	3.29	4.42	5.46
Median	84	83.5	84
Mode	#N/A	#N/A	#N/A
Standard Deviation	11.88	12.51	12.21
Sample Variance	141.06	156.57	149.00
Kurtosis	-1.57	-1.63	-2.23
Skewness	-0.24	-0.37	-0.04
Range	34	33	28
Minimum	62	62	68
Maximum	96	95	96
Sum	1049	644	405
Count	13	8	5

Figure 5

Biol 101 Final Exam Average Scores

	Score
Yearly	82
(%≥70) Sp2021	81
(%≥70) F2020	82

Figure 6

Biol 101 Final Exam Scores & Percent Standards

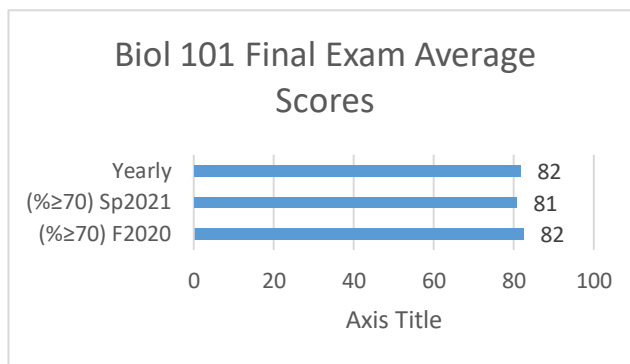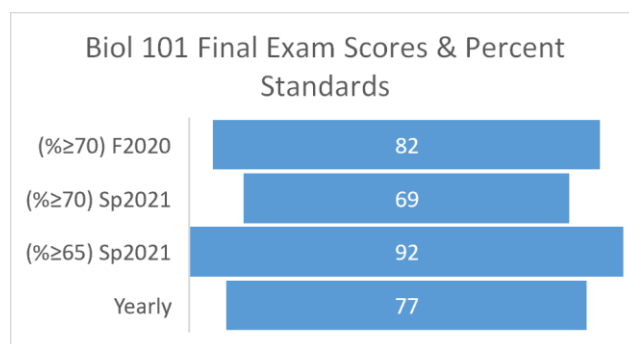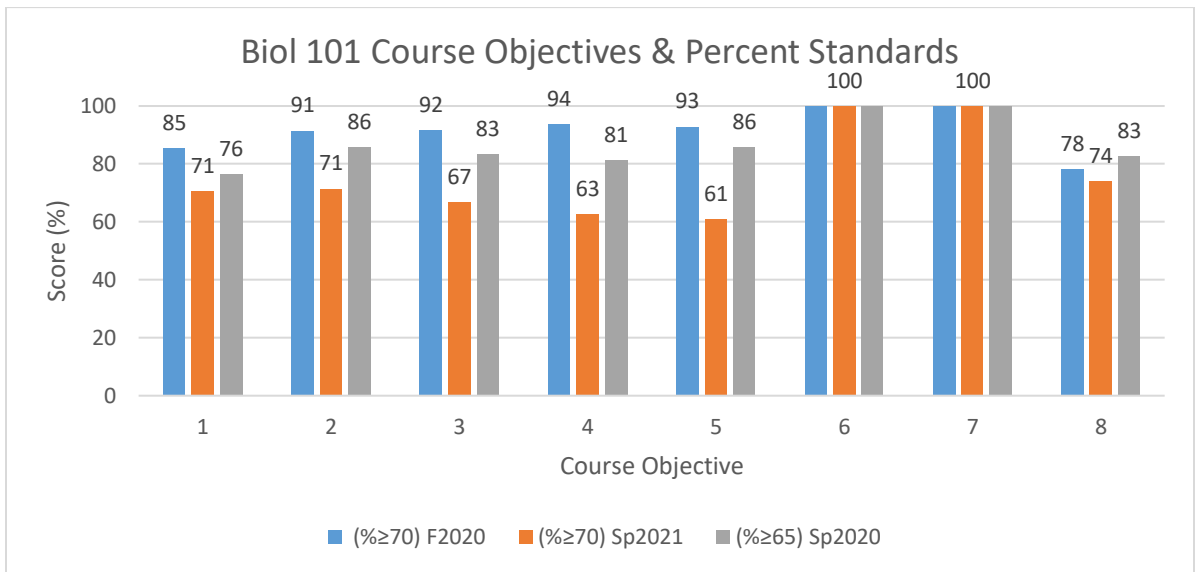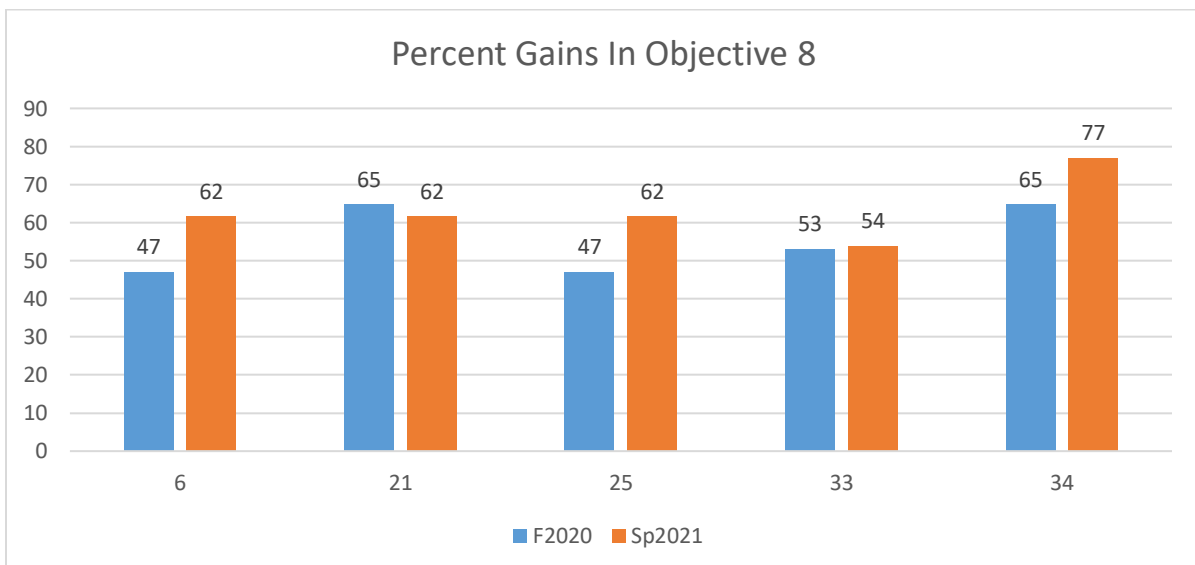|	Score
(%≥70) F2020	82
(%≥70) Sp2021	69
(%≥65) Sp2021	92
Yearly	77

Benchmark 2. Sp2021-Objective and Item Analysis: Meets Standards. The benchmark is that students must score ≥ 65% on each objective. The standard was normalized to ≥ 65 for Spring 2021 because most of the students completed a novel 7-week course instead of the standard 15-week course for Biology 101. Data shows that the course exceeds the benchmark for all standards with scores ranging from 76-100%.

Figure 7

Overall scores for items related to objective 8 increased in Sp2021. This may be attributed to pedagogical modification 1. Positive net gains (80%) were made for 4 out of 5 questions related to objective 8 (Figure 8).
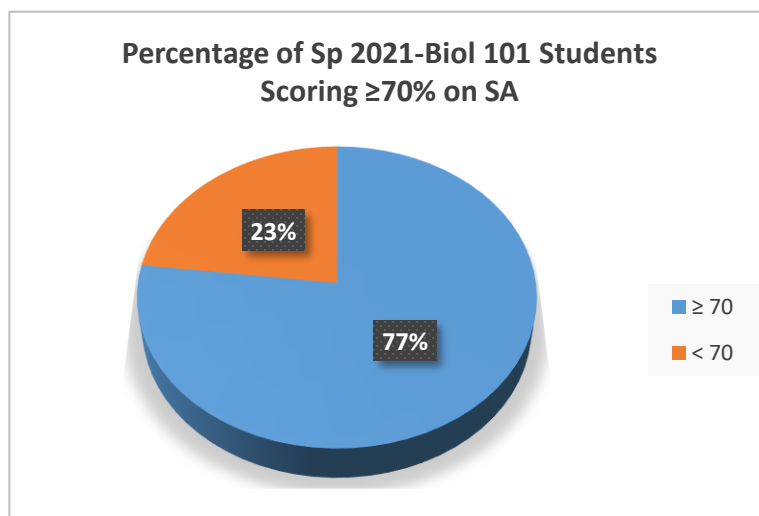
Figure 8

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Benchmark 3 Signature Assignment Scores. The benchmark is that students must score ≥ 70% on the Signature Assignment. 77% of students scored higher than 70 on the assignment, exceeding the benchmark of 70%. Of the 13 assignments scored in Sp2021, the scores ranged from 54-97. The average score was 83.5, with the median of 92 and mode of 60. Of the 13 assignments scored, 8 students scored A (90-100), 1 student scored B (80-89), 1 student scored C (70-79), and 2 students scored a D (60-60), and 2 students scored an F (Table 5; Figure 9).

Table 5   **Figure 9**

Sp2021 Signature Assignment Scores

Sp2021 Descriptive Statistics	
Mean	83.46154
Standard Error	4.444264
Median	92
Mode	60
Standard Deviation	16.02402
Sample Variance	256.7692
Kurtosis	-0.77109
Skewness	-1.01785
Range	43
Minimum	54
Maximum	97
Sum	1085
Count	13

Percentage of Sp 2021-Biol 101 Students Scoring ≥70% on SA

23% 77% ≥ 70 < 70

Final Results and Recommendations

Benchmark 1. Fall2020-Sp2021-Final Exam Score

The benchmark for meeting the standard was that 70% of students must score ≥ 70 on the final exam. Data shows that the course exceeds the benchmark in Fall 2020, as 82% of students scored ≥ 70 on the final exam. Data shows that the course did not meet standards for Sp2021 as, as 69% of students scored ≥ 70 on the final exam. The standard was normalized to 65 for Spring 2021 because most of the students completed a novel 7-week course instead of the standard 15-week course for Biology 101. When the benchmark was normalized to ≥ 65, the benchmark exceeded standards as 92% of the students scored ≥ 65 on the final exam. For the 2020-2021 school year, the course exceeded the benchmark, as 77% of the students scored ≥ 70 on the final exam.

Benchmark 2. Sp2021-Objective and Item Analysis

The benchmark is that students must score ≥ 70% on each objective. Data shows that the course exceeds the benchmark for all standards with scores ranging from 78-100% scoring ≥ 70% on each objective. The benchmark is that students must score ≥ 65% on each objective. The standard was normalized to 65 for Spring 2021 because most of the students completed a novel 7-week course instead of the standard 15-week course for Biology 101. Data shows that the course exceeds the benchmark for all standards with scores ranging from 76-100%. Although the benchmark was met for each objective, objective 8 had the lowest percentage of students meeting the benchmark, and a pedagogical modification (multiple choice assignment) was implemented in Spring 2021. Positive net gains (80%) were made for 4 out of 5 questions related to objective 8 (Figure 8).

Benchmark 3 Signature Assignment Scores.

The benchmark is that students must score ≥ 70% on the Signature Assignment. Data shows that the course exceeds standards for Fall 2020 as, 93% of students scored ≥ 70 on the Signature Assignment. The Signature assignment was also modified to include a research question and hypothesis section which was not a previous requirement of the Signature Assignment, but a major component of any well written scientific paper. The benchmark is that students must score ≥ 70% on the Signature Assignment. 77% of students scored higher than 70 on the assignment, exceeding the benchmark of 70%. For the 2020/2021 school year the course exceeds standards as 85% of students scored ≥ 70% on the Signature Assignment.

Supervisor Signature _____ Date _____

Please forward a copy of the signed report to the Associate Provost of Assessment and Institutional Research.