Continuous Program Improvement (CPI)

Student Learning Outcomes (SLO)/Program Learning Outcomes (PLO)

Plan Implementation Report - AY 2023-24

Program name	Biological and Chemical Sciences - Biology
Expected date of submission	6/30/2024
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Dean's signature	

New York Tech's CPI process is implemented to meet Middle States Commission on Higher Education (MSCHE) Standard V: *Educational Effectiveness Assessment*, which states: "Assessment of student learning and achievement demonstrates that the institution's students have accomplished educational goals consistent with their program of study, degree level, the institution's mission, and appropriate expectations for institutions of higher education."

Each department was asked to create a three-year assessment/evaluation plan to improve student learning for ***each of their degree programs*** covering the following academic years: **2022-2023, 2023-2024, and 2024-2025.**

All degree programs' three-year Program Learning Outcomes (PLO) plans are available here: http://www.nyit.edu/planning/academic_assessment_plans_reports

This is a report on the PLO CPI plan **implementation** for the **2023-24** academic year.

First, please respond to the feedback provided by the CPI Committee in response to your program's prior year (AY 2022-23) CPI plan implementation report. How did you incorporate the Committee's recommendations into your CPI efforts?

We thank the committee for their feedback on our report. We did not receive any recommended actions for program improvement or additional constructive feedback (points 9 and 11) in the Committee's recommendations. In that light we will continue to innovate our program to achieve the best results for our students.

Second, please address the following points in this year's (AY 2023-24) report:

1. Program learning outcomes assessed
   List the program learning outcomes that were assessed in AY 2023-24 based on your three-year plan (2022-25).
   (Please refer to the [guidelines for articulating expected program learning outcomes](#).)

LO#4: Analyze cell structure and function, molecular and biochemical processes and interactions

LO#6: Analyze and explain the flow of genetic information, basic principles on inheritance, recombination and genetic regulation

2. Methods
   Describe the method of assessment that you used (student artifacts, sampling methods, sample size, who and how they were assessed, etc.) and attach measurement instruments (e.g., rubrics, exam items, scoring guide for a particular task, supervisor evaluation form, survey instrument, and other measurement tools). Remember: direct assessment is required, and both direct and indirect assessment are strongly recommended.
   (Please refer to the [guidelines for assessment methods](#).)

LO#4 and LO#6 were each assessed through questions devised by the course instructors and incorporated into the final exams for the respective courses. LO#4 was assessed in BIOL 310 Human Physiology (n = 25) on the Manhattan campus and LO#6 was assessed in BIOL 233 Genetics (n=133) on the Manhattan and Old Westbury campuses. The questions used for each LO are provided below and scored as correct/incorrect in the analysis.

LO#4 Questions in the final exams administered to students in BIOL 310:

1. Which of the following is least likely to be filtered into Bowman's capsule in a normal, healthy person?
a. glucose
b. *plasma proteins
c. sodium
d. urea

2. When intrapulmonary (alveolar) pressure (Palv) becomes greater than atmospheric pressure (Patm)
a. Air will flow into the lungs
 b. There will be no airflow
c. Pneumothorax
d. *Air will flow out of the lungs

3. Salivation in response to the smell of food would not occur if there were a malfunction in the _____ phase of gastrointestinal control.
a. *cephalic
b. gastric
c. intestinal
d. colonic

4. Sarah is taking antacids every day. This habit is raising her stomach and duodenal pH close to neutral. Which of the following enzymes may have decreased activity.
a. *pepsin
b. amylase
c. lipase
d. trypsin

LO#6 Questions in the final exams administered to students in BIOL 233:

1a. 1/400 (1 out of 400) Vulcans lack inner eyelids, putting their eyes at risk from the bright light of their star Epsilon Eridani. This trait (lack of inner eyelids) is recessive. A male with an inner eyelid and a female who lacks an inner eyelid are expecting their first child. What is the probability (fraction) that the male is a heterozygote?
ANS: 38/400

1b. Their first child lacks an inner eyelid. What is the chance their second child will also lack it?
ANS: 50%

2. Exons
a. are non-coding sequences of nucleotides located between coding sequences
b. are regions of DNA that are not transcribed into mRNA
c. *are spliced together for translation following mRNA processing

3. A sex-linked trait
a. is an autosomal trait that appears in one sex but not the other
b. is a phenotype defined by its first appearance at puberty
c. *is coded by a gene on a sex chromosome

4. A lethal allele is
a. *an allele of an essential gene that leads to the individual's death
b. never dominant
c. usually dominant

3. Analyze and interpret assessment data
It is strongly recommended to provide criteria-based analyses of assessment results and based on the analysis to determine if students are meeting the expected learning outcomes.
(Please refer to the guidelines for compiling, analyzing and interpreting assessment data).

LO#4	Fraction NYC students w/ correct answers	Percent NYC students w/ correct answers
Question 1	9/25	36%
Question 2	18/25	72%
Question 3	22/25	88%
Question 4	16/25	64%

LO#4: The fraction of students that correctly answered ranged widely from less than half (36%) to more than three-

quarters (88%). The breadth of this range suggests that students may lack the ability to apply program outcomes equivalently across topics within a course.

LO#6	Fraction NYC students w/ correct answers	Percent NYC students w/ correct answers	Fraction LI students w/ correct answers	Percent LI students w/ correct answers	% Total
Question 1	20/32	62.5%	45/101	44.6%	48.8%
Question 2	21/32	65.6%	77/101	76.2%	73.6%
Question 3	29/32	90.6%	97/101	96%	94.7%
Question 4	31/32	96.8%	77/101	76.2%	81.2%

LO#6: Students' performance on exam questions 2-4 suggest the successful implementation of these objectives. However, overall, less than half of students could correctly answer an exam question requiring them to use both foundational knowledge in genetics (the Mendelian pattern of inheritance/Punnet Square) and simple probability calculations (question 1).

4. <u>Close the Loop</u>
   If the expected program learning outcomes were successfully met, describe how the program will keep or expand the good practices. If they were not successful, explain how you have or will refine the plan and begin the next cycle of <u>Plan-Do-Study-Act (PDSA)</u>.
   (*Please refer to the <u>guidelines for closing the loop and taking action to improve program learning outcomes</u>.*)

LO#4: Despite all 4 questions addressing the same learning outcome, the fraction of students that correctly answered ranged widely from less than half (36%) to more than three-quarters (88%). The breadth of this range suggests that students may lack the ability to apply program outcomes equivalently across topics within a course. Rather than approach a remedy in the classroom that gives more attention to topics that students tend to find confusing or difficult, we could assess students through a project that implements the learning outcome(s) across topics in the curriculum.

LO#6: Our data suggests our students may need more time to work on complex questions by adding more quantitative work into the topics discussed and analyzed in class, so that students can benefit from hearing step-by-step explanations and from studying examples in collaboration with others.

5. Describe how faculty were involved in the implementation of the PLO CPI plan and how the results will be communicated to all stakeholders.

   For each LO faculty members teaching the course identified the best method of assessment and way to implement the assessment. Data analysis was conducted by each instructor and the results were pooled and analyzed by the group of instructors. The results of these analyses will be communicated to all stakeholders through reports such as this one, yearly faculty retreats, and monthly faculty meetings.