CTE Annual Assessment Report Template

The purpose of CTE program-level assessment at PCC is to look at student achievement of degree and certificate-level outcomes and to help faculty focus on how to improve student learning based on assessment.

Please choose **one** of the degree and/or certificate outcomes that was part of this year's Summary Data Report, and provide a more in-depth explanation of your assessment process, results and how this might be used to enhance teaching and learning.

This form to be used for both assessments (first time the outcome is assessed) and for re-assessments (a follow-up for the initial assessment of the same outcome).

On completing the form, please e-mail it to learningassessment@pcc.edu.

SAC Assessment Contact(s):

Name	*e-mail*
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1. Which SAC do you represent?

Bioscience Technology (BIT)

2. Which outcome is reported here? (Please provide the text of the outcome, and the degrees/certificates to which it applies).

Apply knowledge of measurement and assay principles and strategies, purification principles, and the scientific method to laboratory situations. (BIT AAS Degree Outcome)

3. Please share how this outcome was assessed to help us understand your process for assessment. Please attach a rubric, sample score sheet, or other assessment tool.

This outcome is assessed via the technical skill assessment (TSA), which comprises three exams in fall term BIT 109, Basic Laboratory Techniques and Instruments. The TSA rubric is attached.
Students are required to demonstrate their ability to accurately perform measurements with various common laboratory devices as well as perform dilutions and assays on solutions of unknown protein concentration.

4. Please include information about your benchmark (the score that indicates successful attainment of the outcome), and how it was determined.

For the TSA, there are 15 items evaluated on a scale of 0 to 2 points. A score of 0 indicates large deviations from expected results and no apparent ability to use the laboratory device. A score of 1 indicates some deviation from expected results and a developing ability which requires further practice. A score of 2 indicates expected results and demonstrated ability to use a given laboratory device according to standard operating procedures.
Overall, a maximum score of 30 points is possible and a minimum score of 21 points is required to pass the TSA. Students who do not pass the TSA are required to meet with the BIT 109 instructor to review their technique in using various laboratory devices and the student must demonstrate improvement and understanding in order to correct mistakes, pass BIT 109, and continue on to the advanced lab technique courses for which BIT 109 is the prerequisite.

5. Please provide data collected in the assessment of this outcome (including score distribution and percent of students meeting benchmark). Summarize your findings in the box below. Attach supplemental information or appendices. For this report, **please do not include student identifying information**, but you can assign an arbitrary identifier, especially if you wish to reference individual scores in your discussion.

In Fall 2018, 22 students took the TSA exams and 21 (95%) passed with a score of 21 or higher. The range of scores was 20 to 30 points, with an average score of 25.6 and a median score of 26. Most students only made mistakes on a few of the laboratory tasks and were able to identify and correct errors in their technique or equipment use in order to obtain repeatable and reliable measurements and data using the lab equipment.

6. Please discuss your overall findings regarding student learning. (What did you learn from this assessment? Were there any surprises? Do the data make sense? How do the data relate to student learning?)

Overall, students demonstrate their ability to use pipettes, balances, graduated cylinders and other volumetric measuring devices, pH and conductivity meters, spectrophotometers, and microplate readers to evaluate protein assay results. Each skill is evaluated on a 2 point scale, as described in question 4 above. The average scores for each skill ranged from 1.23 up to 1.95. In providing feedback to the class, I focused on skills with an average score below 1.5, indicating a larger number of students with scores of 0 or 1 and indication of incomplete skill development.

For this year's cohort, the skills with lower scores included measurements via graduated cylinders (which came as a surprise) and evaluation of standard curves (less of a surprise given that this is a more advanced skill that students find challenging year after year). I used the feedback and discussion as an opportunity to review sources of error and determined that students tended to make systematic errors in reading graduated cylinders by not reading the devices at eye level due to their placement in a fume hood. In future lessons, I will remind students that they can move the devices, or move themselves, and that they must be at eye level to properly use the device. Regarding the results for student interpretation of standard curves, I plan to include a course activity in which students review peer results in groups and I remind them of the acceptance criteria required for standard curves.

7. Please reflect on the entire project and share how your CTE SAC will use the results to improve student mastery of this outcome. Are there changes that need to be made to improve teaching and/or learning?

Overall, student mastery of this outcome is high. In addition to assessment in BIT 109, students continue to develop skills in measurement and assays in later courses, including BIT 205, Bioseparations, and BIT 215, Protein Purification. At this time, there is no apparent need to change teaching approaches for this degree outcome. One change that is proposed is to include more lab practical assessments for this outcome, as many but not all lab courses include this assessment. This would ensure that students continue to use and refine the skills developed in BIT 109 throughout their advanced coursework.

8. What changes do you plan to make to your assessment of this outcome in the future?

No changes for the TSA are planned in the next academic year. As stated for question #7, the department is working to include more lab practical assessments in other courses which do not currently include this type of assessment.

Has the outcome been assessed before? (If not, skip this question).

9. Were any modifications to instruction implemented between the prior assessment and this one? How did the assessment methods and results compare with the prior assessment?

This outcome has been assessed via the TSA twice, in 2017 and 2018. In both years, the assessment method was the same and the pass rate was 95%. The instructional method was not significantly modified. As described in question 6, it is our instructional practice to review results collectively with the students and discuss common mistakes and skills with lower scores. This may lead to additional instructor demonstrations or additional opportunities for student practice with lab equipment during class or open lab periods.

To help us understand your SAC's overall processes, please complete these additional questions.

1. Was the SAC able to include Part-Time (PT) and Full-Time (FT) faculty for this assessment? If PT faculty did not participate, please explain any barriers that might account for this fact.

No part-time faculty participated. BIT is a small program with one full-time faculty member who teaches BIT 109 each fall. No other instructors teach this course and assess students via the TSA. Each course in the program is taught in one section by one faculty member per year.

2. How do you plan to share this information with all members of your SAC?

The TSA results are discussed at SAC meetings to inform other faculty and staff of student performance and readiness for advanced lab courses.

3. Are there any areas that you might want help with from your CTE coach? Please let us know.

It could be helpful to have discussions with my coach and with other CTE departments regarding assessment of certain skills. In previous years, we collectively held a TLC workshop on "teamwork." Multiple CTE programs were represented to discuss common challenges and strategies for teaching, embedding, and assessing teamwork in our classes.
A future collaboration could be helpful in addressing another BIT degree outcome, "*Plan and organize tasks to allow efficient completion of complex procedures, including planning and executing multiple procedures that proceed simultaneously*." I provide instruction to students on planning and time management in the lab, yet I believe I could develop better practices to assess this outcome, and I believe other CTE programs likely face similar challenges in teaching and assessing skills pertaining to organization and planning.

4. Is there anything else you would like to share with us? Please let us know.

Please refer to the TSA rubric on the following pages.

Thank you for completing this report!

We hope this has been a useful project to help your CTE SAC assist your students!

Skill #	Description of technical skill	Performance indicator
1	**Accurately measure a quantity of NaCl**	obtain quantities within 5% of true value
		obtain quantities with deviation of 5 - 10%
		obtain quantities with greater than 10% deviation
2	**Accurately read volume in a graduated cylinder**	obtain quantities within 0.5mL of true value
		obtain quantities with deviation of 0.5 to 1.0 mL
		obtain quantities with greater than 1.0 mL deviation
3	**Accurately transfer a volume with a serological pipet**	obtain quantities within 0.2mL of true value
		obtain quantities with deviation of 0.2 to 0.4 mL
		obtain quantities with greater than 0.4 mL deviation
4	**Accurately transfer a volume with a micropipet**	choose correct micropipet and transfer a volume within 5% of true value
		choose correct micropipet and transfer a volume with a deviation of 5 - 10%
		choose the wrong pipet, or obtain a greater than 10% deviation
5	**Calibrate a pH meter and measure the pH of an unknown solution**	observed pH values are within 0.2 pH units of true value
		observed pH values are within 0.3 pH units of true value
		observed pH values have deviations greater than 0.3 pH units
6	**Use a conductivity meter to identify among unknown solutions**	correctly identify salt solution vs water based on conductivity
		(score not assigned)
		incorrectly identify sample corresponding to salt solution
7	**Evaluate buffers and non-buffered solutions**	correct identification and pH change within 1 unit of expected
		correct identification but with large pH deviations above 1
		incorrect identification of buffered solution
8A	**Documentation: Complete materials list for preparing a buffer**	record equipment and chemical list with all required identifying information
		record equipment and chemical list with some of the required ID info
		record minimal amount of ID info or does not include the equipment
8B		grams of each solute correctly calculated and sig fig rules followed

	Documentation: Correctly perform calculations	grams of each solute correctly calculated though lacking required precision
		grams of solute incorrectly calculated
8C	**Documentation: Protocol steps for preparing buffered solution**	correct protocol with all required steps included
		correct protocol with 1 or 2 missing or incorrect steps
		more than 2 missing or incorrect steps
8D	**Documentation: Follow notebook standards**	follow all documentation standards
		1 significant deviation from documentation standards
		2 or more deviations from accepted documentation standards
9	**Accurately measure absorbance of unknown solutions**	observed absorbance values within 5% of true value
		observed absorbance values with a deviation of 5 - 10%
		observed absorbance values with greater than 10% deviation
10	**Prepare serial 1/10 dilutions**	correct set up and A517 values correspond to correct dilution factor
		correct set up with deviations from expected A517 values
		incorrect set up for serial dilutions
11	**Perform Bradford assay on standards and unknowns**	correctly ID sample in 500-1000 ug/mL range, obtain expected A595 values
		correctly ID sample in 500-1000 ug/mL range, obtain inaccurate A595
		incorrectly identify the sample in the 500-1000 ug/mL range
12	**Use a standard curve to interpolate concentration of unknowns**	differentiate interpolation vs extrapolation; calculates correct value
		calculate via extrapolation and/or without considering dilution factor
		incorrect calculation of unknowns

Score of 21 to 30 points: Pass

Score of 0 to 20 points: Fail