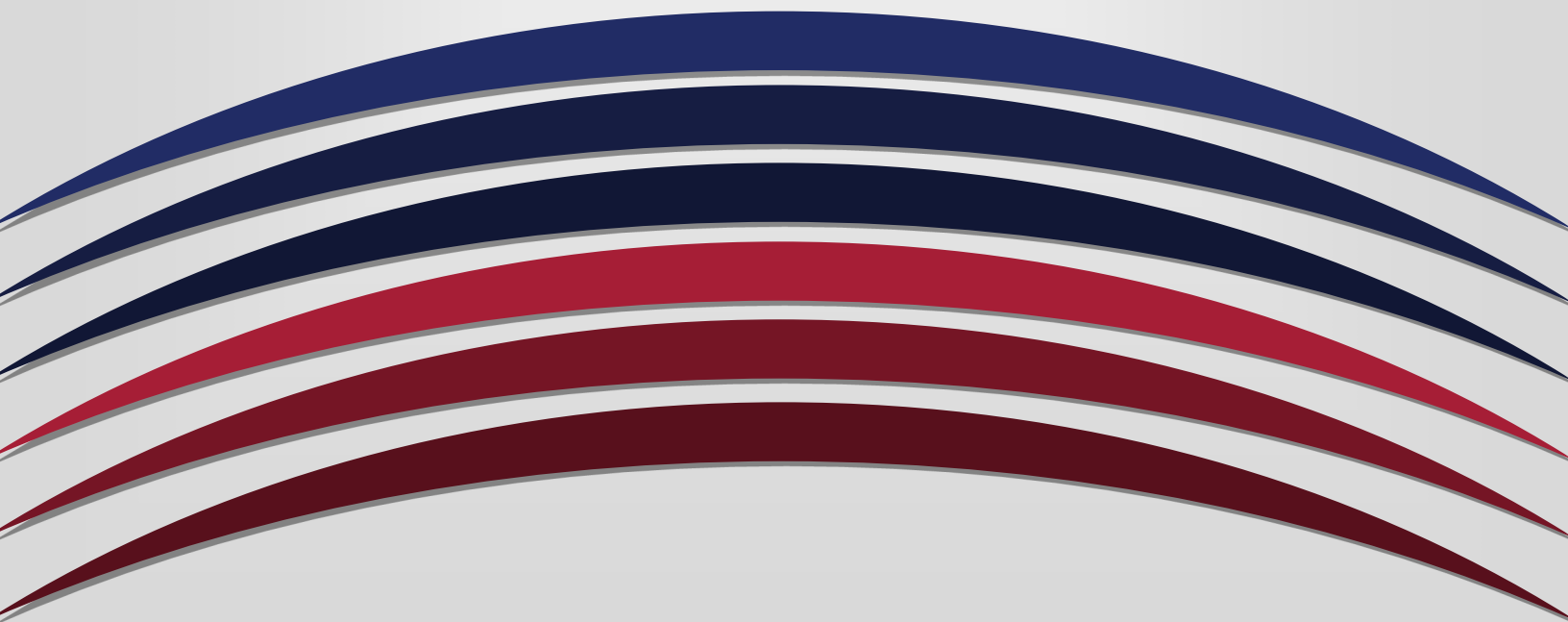




UNIVERSITY OF ARKANSAS
PULASKI TECH

Course-Level Assessment Report
Course: BIOL 2101 Microbiology
Lab

Academic Year: 2021-2022



1. Name of course: Microbiology Lab
2. Name of individual(s) compiling report: Deborly Wade, Ph.D.
3. Date of submission: 9/15/22
4. Academic year: 2021-2022

Course-Level Learning Outcomes

1. What are the Course-Level Outcomes (CLOs)?

By the end of the course, the students will be able to:

1. Properly adjust microscope and analyze specimens at high magnification using oil immersion.
2. Prepare stained slides for microscopic analysis.
3. Use proper aseptic and safety techniques in microscopic testing and analysis.
4. Analyze results and provide conclusions from microbiological tests.

These CLOs are based on ACTS Course 2004 lab CLOs

2. Which CLOs were addressed for the academic year?

CLOs 1 and 2

3. Which CLOs are being addressed in your assessment plan in the upcoming academic year?

CLOs 1 and 2

4. How does this report connect or map to program-level or institutional-level outcomes?

CLOs are assessed every semester with major changes in assessment occurring annually. New assessment efforts usually start in the spring semester, with follow-up in the fall. Instructors meet at the beginning of each semester to analyze old results,

develop changes to curriculum and assessment, and determine how assessment will be carried out.

For each Course Level Outcome assessed this academic year, please complete the chart below, providing the assessment data for both fall and spring, and then a total for the academic year.

| | | |
|---|---|-----------|
| <p>Assessment Methods- How did you assess student learning (define direct assessment methods used) in relation to the course level outcome being reported?</p> <p><i>Note: If more than one assessment method was used, you may insert an additional row.</i></p> | <p>CLO1 Properly adjust microscope and analyze specimens at high magnification using oil immersion.</p> <p>Students analyzed bacteria using a compound light microscope and determined the Gram status, shape and arrangement of the specimen. This analysis was directly linked to CLO1. Data was collected from five (5) sections from face-to-face labs during Fall 2021 and Spring 2022. Students were given learning materials and instructions several weeks before the assessment. Practice microscopes were available to the students the week before the assessment. Student responses were recorded on a fill-in-the blank answer sheet without a word bank. A threshold of 70% was used to determine competency for the overall assessment.</p> <p>CLO2 Prepare stained slides for microscopic analysis.</p> <p>The assessment is directly linked to CLO2. Students received prior instruction and performed the Gram stain protocol during face-to-face laboratory meetings. For the assessment, students were provided with bacterial specimens of unknown Gram status. Students prepared slide smears from the bacteria provided and stained them using the Gram stain technique. Stained slides were collected and results were scored by the instructor for accuracy. A threshold of 70% was used to determine competency for the overall assessment.</p> | |
| <p>Were indirect assessment methods also used to assess students? If 'yes', please describe the method used.</p> | | <p>No</p> |

| | | |
|---|--|--|
| | | |
| How do you define success for an individual student on the CLO assessment assignment or measure? | A score of 70% was used as a threshold for competency. | |
| How do you define success for the course level outcome? What is the benchmark for the Course Level Outcome? | 70% of students in the course achieve success on the CLO assessment assignment or measure | |
| How many students completed the assessment, and how many were successful? | CLO1 Fall 26 students assessed 23 successful (88% success rate) CLO1 Spring 47 students assessed 38 successful (81% success rate) | CLO2 Fall 26 students assessed 22 successful (85% success rate) CLO2 Spring 44 students assessed 42 successful (95% success rate) |
| Academic Year Total (add the numbers from Fall and Spring) | CLO 1 73 students assessed 61 successful (83% success rate) | CLO2 70 students assessed 64 successful (91% success rate) |
| Was the benchmark/goal for this academic year met? | Yes | Yes |
| Were standardized rubrics, tests, or checklists used? | No* *Refer to the discussion analysis below | No Assessment results are qualitative (either Gram positive or Gram negative results), and not quantitative |

5. What is your analysis of the findings?

For CLO 1. Properly adjust microscope and analyze specimens at high magnification using oil immersion.

Prior assessments for proper use of the microscope have been performed in past semesters using a checklist and rubric. While we are currently not reporting on that skills assessment, this continues to be given during the semester. In the current assessment, our focus is on the ability of students to “analyze specimens” by correctly naming three key identifying characteristics of bacteria: (1) Gram status, (2) shape and (3) arrangement. Students must provide the responses after viewing the specimen through the compound light microscope and write the correct response in the blank. *For question 1, there are only two possible answers (positive or negative, or +/-) so a rubric is unnecessary. For question 2, there are only two possible answers (coccus/cocci or bacillus/bacilli). However for question 3, the student must combine terms derived from Greek/Latin roots – such as “staphylococcus” or “streptobacillus.” While students are not generally penalized for misspelling, the response must be accurate and recognizable by the instructor. Understandably, question 3 is the most challenging for students. It is possible that students could benefit from a pre or co-requisite of Medical Terminology which is offered through the Health Information Technology program.

For CLO2. Prepare stained slides for microscopic analysis.

A similar assessment has been performed and analyzed in previous semesters. The prior assessment version used a detailed checklist and rubric for scoring. The assessment process required additional lab periods to complete. Once it was determined that students were mastering this skill based on this previous assessment analysis, the assessment method was condensed. Rather than observing every single step performed by students using the Gram stain protocol, the students are submitting their completed slide to the instructor after the Gram staining process. The instructor scores the student slide based upon the accuracy of the results. Students have continued to perform well on this assessment which is a hands-on exercise that students are usually quick to grasp and master. Perhaps more importantly, this builds the students’ confidence in their laboratory skills.

6. What is the action plan for the upcoming academic year? Explain.

Instructors meet each semester and to analyze assessment results and discuss changes to curriculum and assessment. Plans for piloting of new assessments in the spring are made and followed up each fall. With the recent renovation and relocation of lab facilities, comes new opportunities to enhance student learning experiences on our campus and new ways to capture those learning experiences on paper. Plans for this next academic year are discussed below.

For CLO 1. Analyze specimens at high magnification using oil immersion.

Instructors are piloting an online version of this assessment which uses a multiple choice quiz. In order to develop comparable assessment materials for the face-to-face and online lab sections, the adoption of a multiple choice assessment will be considered during the Fall 2022 semester for piloting by all sections during Spring 2023. The

adoption of a multiple choice version would also eliminate any subjective scoring bias for “forty-five letter” words.

For CLO 2. Prepare stained slides for microscopic analysis.

Due to the consistency in the student success rate for the Gram stain procedure, instructors will discuss retiring this assessment from assessment reporting during the Fall 2022 review process. This would permit focusing on CLOs 3 and 4 for upcoming assessment reporting. The recent renovation and relocation of the Microbiology lab provides new opportunities for assessment of student learning, which is discussed below.

For CLO 3. Use proper aseptic and safety techniques in microscopic testing and analysis.

A tested and reproducible aseptic technique assessment was published courtesy of the American Society for Microbiology in the Journal for Microbiology and Biology Education in 2013¹. This protocol, or a similar one, requires the maintenance of specific strains of bacteria, and specific types of culture media and growth conditions. Performing this assessment on a routine basis would require the ability to maintain specific bacterial stocks long-term. Our current refrigeration situation precludes the long-term storage of bacterial cultures for performing routine lab experiments with consistent results.

For CLO 4. Analyze results and provide conclusions from microbiological tests.

The ability to perform ideal academic microbial testing is hindered by the lack of updated equipment and the ability to maintain bacterial stocks suitable for testing and analysis. Currently, bacterial stocks must be maintained through a series of culturing, sub-culturing and short-term storage in a noncommercial or industrial refrigerator. This makes it necessary to frequently order new bacterial stocks due to the inability to store bacterial stocks long term. With the passage of multiple subcultures, bacteria accumulate mutations that make them unsuitable for returning consistent and reliable results. In order to maintain stock cultures, a specialized freezer is highly desirable².

1. Aruscavage D. Semester-long assessment of aseptic technique in microbiology labs. J Microbiol Biol Educ. 2013 Dec 2;14(2):248-9. doi: 10.1128/jmbe.v14i2.552. PMID: 24358390; PMCID: PMC3867764.
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3867764/>
2. Thermo Scientific™ TSX ultra-low freezer package with racks, boxes and access key
<https://www.fishersci.com/shop/products/tsx-ultra-low-freezer-package-racks-boxes-access-key-8/p-7112099#?keyword=>