

EWU Programmatic SLO Assessment

AY 2014-15

Degree/Certificate: Physics

Major/Option: BS, BA, BAE

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Program SLO Assessment Report for 2014-15

Because Deans have been asked to create College-Level Synthesis Reports annually, the template has been slightly modified for a) clarity for Chairs and Directors, and b) a closer fit with what the Deans and Associate Deans are being asked to report.

1. **Student Learning Outcome:** Students will make and interpret laboratory measurements in physics.
 - A) *This SLO is being evaluated from student work in Physics 321 and 322 in Winter and Spring quarters, 2015. These classes consisted of at least one student in each of the following degree options: BS, BA, and BAE*
 - B) *For the purposes of this assessment, this SLO is defined to mean the following:*
 - i) *The students can collect data in a neat and organized fashion, including at levels of precision consistent with the apparatus used. This objective is assessed by grading the students' notebook entries for each experiment.*
 - ii) *The students can process their numerical values in accordance to what proper interpretation requires, and can correctly interpret the meaning of their data in context of an experiment. This objective is assessed by grading the data analysis steps and answers to selected questions about the data.*
 - iii) *The students can convey those correct interpretations in written form as would be expected in a scientific publication. This is assessed by grading the written reports for each lab. Each report grade features points for an abstract, procedure, and analysis section.*
2. **Overall evaluation of progress on outcome:**

Defining 70% of total points in the combined categories (i, ii, and iii above) as meeting the SLO, six of 13 students who completed Physics 321 and six of eight completing 322 met the objective. One student in each class excelled (greater than 85% of total points.) With 12 of 21 students meeting the learning objectives, there is room for improvement. Strategies will discussed below.

3. **Strategies and methods:**

The following is a breakdown of the numbers for the three categories of the learning outcomes.

Item i) there were four times in the two quarters for which notebook grades exist as separate entries in the grade sheet. The class average for each instance is expressed as a percentage of total points. These averages are 92, 75, 69, and 70.

Item ii) There were six times in the two quarters for which analysis grades exist as separate entries in the grade sheet. The class average for each instance is expressed as a percentage of total points. These averages are 59, 82, 64, 66, 56, and 87.

Item iii) There are three instances for which report grades exist as separate entries in the grade sheet. Expressed as percentages of total points, the class averages are 64, 71, and 73.

Within the lab reports, three separate portions were assessed: the abstract, the procedure, and the analysis. The class averages for the abstracts on each of the three reports were 75, 80, and 52. On the procedures, these were 60, 56, and 79. On the analyses, these were 58, 67, and 78.

All other experiment grades were recorded as a single score, not broken down by category.

4. **Observations gathered from data:**

- a. Findings: The students average consistently a bit below the satisfactory level in nearly each category, though the experiments are clearly varied in level of difficulty they pose, both in analysis and interpretation.*
- b. Analysis of findings: The recording of experimental data and conditions is not a skill that the students come into lab with, and while barely acceptable overall, had wide variation from student to student. Data analysis continues to be a difficulty in a setting in which each student is entirely responsible for organizing the steps – in contrast to earlier laboratories in which “cookbook” formulation is the norm. Perhaps more sophisticated introductory labs could alleviate this to a degree. Written reports continue to vex students, as they have little practice in prior “cookbook” labs, but here too the results are uneven. For example, the worst abstracts were on the last lab in the entire set, primarily because the actual numerical results were left out of the abstract. Yet, as the final report, this was the one for which there had been the most practice, and the expectation would be that these should be the best.*

5. **What program changes will be made based on the assessment results?**

a) *Emphasis should be increased on good experimental recording practice. The biggest factor affecting the data analysis is the fact that students tend to put off the analyses to the last minute, and run out of time when they encounter difficulty. This is a very difficult problem to solve. Perhaps intermediate deadlines can be implemented to keep them progressing on each experiment in a timely manner. This is not simple, as each pair of students must complete each experiment on different days. An equal time frame for each pair would necessitate separate due dates. Increased emphasis on the process of writing scientific reports is warranted. One strategy might be to come together after each lab is graded and look at how the sections could be improved. The structure of the course did not enable this to be easily implemented, and the next version will be different.*

b) *These courses are offered every other year. Hence the changes will be implemented in Winter and Spring of 2017.*

6. *The simplest change for the assessment process is to work it into the course evaluation steps from the beginning. This would enable tracking of improvement (or declines) in student success throughout the two quarter sequence.*