

Physics Students' Data Analysis Skills

Physics BS – College of Natural Sciences and Mathematics

Step 1: Student Learning Outcome

Students will extract meaningful data from physical systems and construct conclusions through data analysis.

Step 2: Methods and Measures

Students majoring in physics take four laboratory courses at CSUF, two at the introductory physics level, one at the junior level, and an advanced lab at the senior level. The outcome is measured using a student laboratory report from the senior level advanced lab course, PHYS 481.

To determine whether students have taken (and reported) an adequate amount of data and have presented it clearly, labs are scored via rubric using a four-point scale;

1. Data are missing or not clearly identified in the report
2. Data are included, but details on presentation are missing
3. Data are clearly labeled but not enough detail is provided in how the data were collected
4. Data are clearly presented and sufficient detail is provided

Conclusions are scored based on the following scale;

1. No conclusion present
2. Conclusion is present but is not clearly linked to the data presented
3. Conclusion references data but uncertainty and/or error are not adequately addressed
4. Conclusion is drawn from the data and includes a discussion of uncertainty and/or error

Step 3: Criteria for Success

Students must complete both components of the SLO by extracting meaningful data and constructing conclusions through data analysis, with 75% of the mini-experiments scored at a 3 or 4 on each rubric.

Step 4: Results

In 2018-2019, the Magnetic Torque lab was selected for assessment. Each lab report included four mini experiments requiring individual data collection and analysis. Five lab reports containing a total of 20 mini experiments were selected and assessed by the Assessment Coordinator.

Results indicated that 100% of the mini-experiments achieved a 3 or a 4 on both rubrics, which meets the criteria for success.

Step 5: Improvement Actions

Although the criteria for success was exceeded, it was determined that the criteria and the scoring system could be improved. It is recommended that “Error Reporting” be required for success, as the current system allows a score of “3” or “4” without any discussion of error. A possible modification would be assigning a score of “2” instead of “3” if there were no mention of “error”. “Error Reporting” should be consistently addressed throughout the physics curriculum. The scoring system could be improved by undergoing inter-rater reliability testing, with at a minimum, multiple reviewers scoring reports.