

Major Assessment Report Undergraduate Biomedical Physics Program

Please download this document and provide a response to each question in the appropriate section. Send your assessment reports to the Director of Assessment, Dr. Melissa Jordine (mjordine@csufresno.edu). (Reports can be sent to Dr. Jordine via campus mail to mailstop SS 21). Please complete a separate report for each B.A/B.S. and M.A/M.S. program offered by the department.

1. What learning outcome(s) did you assess this year? List all program outcomes you assessed (if you assessed an outcome not listed on your department SOAP please indicate explain). Do not describe the measures or benchmarks in this section Also please only describe major assessment activities in this report. No GE assessment was required for the 2016-2017 academic year.

SLO 2.3: Graduates will be able to communicate their understanding and results from the “hands-on” laboratory experience in common written format.

2. What assignment or survey did you use to assess the outcomes and what method (criteria or rubric) did you use to evaluate the assignment? If the assignment (activity, survey, etc.) does not correspond to the activities indicated in the timeline on the SOAP, please indicate why. Please clearly indicate how the assignment/survey is able to measure a specific outcome. If after evaluating the assessment you concluded that the measure was not clearly aligned or did not adequately measure the outcome, please discuss this in your report. Please include the benchmark or standard for student performance in your assessment report (if it is stated in your SOAP then this information can just be copied into the report). An example of an expectation or standard would be “On outcome 2.3 we expected at least 80% of students to achieve a score of 3 or above on the rubric.”

Five lab reports from five different students who took the Physics 135 (MRI/MRS of the brain) course during the fall 2016 semester were scored. The scoring rubric was used with permission from the Department of Biology where it is utilized to evaluate student submissions to satisfy the Graduate Writing Requirements. The scoring rubric was composed of four sections. Each section corresponded to a major component of the scientific writing and communication: (I) style and format, (II) mechanics, (III) content and organization, and (IV) integration and critical analysis. Each rubric was assigned a 1-5 numerical score which marked in increasing order the student achievement of specific scientific writing requirements in each of the four components aforementioned. A

comprehensive list of these requirements for each rubric is included in the *Additional Guidelines* section at the end of this document. Rubrics (I) and (II) evaluated students' ability in communicating their understanding and results from "hands-on" experiments in a consistent, logical, and easy-to-read manner. Rubrics (III) and (IV) scored students' performance in lab report organization, applying and interpreting results using appropriate analysis and discussion, and describing in sufficient detail the experimental design and method they used. Each lab report had to be organized in four sections corresponding to the typical layout of a scientific paper: (1) introduction/theory, (2) materials and methods, (3) results and discussion, and (4) conclusions. Rubric (IV) addressed aspects somewhat beyond the limited scope of the student learning outcomes included in the previous section. The rubric scored students' ability to integrate and discuss critically their results in the larger context of specialized existing scientific literature and not just relate their results to the concepts learned in class. While we strive for our undergraduate students to learn and master all aspects of scientific writing, our expectations have to be realistic. We also accounted for the fact that Physics 135 course, as well as all other undergraduate courses, are students' first encounter with a specialized, more advanced scientific area. Moreover, for most students it was the first time they were required to write a formal lab report with publication-like guidelines. Mastering scientific writing and competent use of statistical data analysis methods requires many years of practice and additional courses. However, we seek for students to learn and apply the typical standards and basic mechanics of such type of communication. With these reflections in mind, we expected our students to obtain a score of 3 or better in each of the four rubrics. The student lab reports were evaluated by two faculty members within the Biomedical Physics program (full-time and adjunct) who were not involved in the student instruction directly related to the student lab reports under review.

3. What did you discover from the data? Discuss the student performance in relation to your standards or expectations. Be sure to clearly indicate how many students did (or did not) meet the standard for each outcome measured. Where possible, indicate the relative strengths and weaknesses in student performance on the outcome(s).

The table below shows the score statistics as provided by the two evaluators for each rubric. The two values for each rubric correspond to the scores provided by the two evaluators.

Estimator	Style and Format		Mechanics		Content and Organization		Integration and Analysis	
# students score ≤ 2	1	2	1	0	0	1	0	1
Maximum score	4	4	4	4	5	4	5	5
Minimum score	2	2	2	3	3	2	3	2
Mean	3.2	3.0	3.4	3.4	3.6	3.0	4.0	3.2
Median	3.0	3.0	4.0	3.0	3.0	3.0	4.0	3.0

It can be seen that at least one student failed in each category (i.e. rubric) evaluating an aspect of scientific writing. Style and format area had the most students (2) receiving a low score of 2. This is a somewhat peculiar result since the style and format are arguably the least difficult components of scientific writing. The deficiencies noted in this area are perhaps the result of an insufficient effort dedicated to the lab report writing rather than lack of skills, misconception, or misunderstanding. No student received the score of 1 and only one student received two scores of 2 in two rubrics in one of the two evaluations. The mean and median values indicate that, on average, students met and even exceeded the set benchmark in all scientific written communication areas.

4. What changes did you make as a result of the data? Describe how the information from the assessment activity was reviewed and what action was taken based on the analysis of the assessment data.

The results of the assessment indicate an overall satisfactory student performance in the area of scientific writing. However, the scores indicated deficiencies, particularly in the area of format and style. We do not suspect major lapses in the instruction associated with the teaching of the style and format of scientific writing. The underperformance of some students in this area is very likely the result of a lack of practice and insufficient dedicated effort. As a remedy we plan to implement a stronger emphasis of this basic aspect of scientific communication by allocating additional instructional time and, perhaps, setting a larger weight in the grading scheme of lab reports. The scores indicated deficiencies in all areas of scientific communication, but, overall, they also demonstrated that students learned most of the basic skills and mechanics of scientific writing. We believe the inconsistencies noted in the rigorous application of the stylistic and formatting rules as well as in the other aspects of written scientific communication can improve with additional practice. Therefore, with the exception of the noted emphasis on the style and format, we consider that no urgent action is required at this time.

5. What assessment activities will you be conducting in the 2017-2018 AY? List the outcomes and measures or assessment activities you will use to evaluate them. These activities should be the same as those indicated on your current SOAP timeline; if they are not, please explain.

In the 2017-18 AY we are planning to assess Student Learning Outcomes 2.1, 2.2, and 2.4 by looking at the student grades obtained in the upper-division Biomedical Physics courses: Physics 135, Physics 136, Physics 137, Physics 156, and Physics 157 as indicated in our current Biomedical Physics SOAP document. The required benchmark was for the 67% of the students to obtain a letter grade of C or better in these courses.

6. What progress have you made on items from your last program review action plan? Please provide a brief description of progress made on each item listed in the action plan. If no progress has been made on an action item, simply state “no progress.”

Currently, the Action Plan is at its final step in the external review process. Our review visit took place on September 26 and 27, 2016. The final report document of the Review Committee was turned in December 2016 and our department turned in a response to the final report on February 7, 2017. The department will have to wait for the response submissions by both the Dean and the University Committee Review Team before an Action Plan can be written. Therefore, at this stage, we do not have an Action Plan from our recent review.

Additional Guidelines: If you have not fully described the assignment then please attach a copy of the questions or assignment guidelines. If you are using a rubric and did not fully describe this rubric (or the criteria being used) then please attach a copy of the rubric. If you administered a survey please consider attaching a copy of the survey so that the Learning Assessment Team (LAT) can review the questions.

Scoring rubric used to evaluate the student writing in the Physics 135 lab reports:

I. Style and Format:

5-Exemplary: In addition to meeting the requirement for a "4," the paper consistently models the language and conventions used in the scholarly/ professional literature appropriate to the student's discipline. The student's GWR would meet the guidelines for submission for publication in a peer reviewed biological journal in the student's field of study or the meet the guidelines necessary to submit as a proposal for federal funding (e.g. NIH, NSF)

4-Accomplished: While there may be minor errors, conventions for style and format are used consistently throughout the paper. Demonstrates thoroughness and competence in documenting sources; the reader would have little difficulty referring back to cited sources. Style and format contribute to the comprehensibility of the paper. Suitably models the discipline's overall publication or proposal style.

3-Satisfactory: The style and format are broadly followed, but inconsistencies are apparent. There is selection of less suitable scientific sources (non-peer reviewed literature, web information). Weak transitions and apparent logic gaps occur between topics being addressed. The style may be difficult to follow so as to detract from the comprehensibility of the manuscript.

2-Developing: While some discipline-specific conventions are followed, others are not. Paper lacks consistency of style and/or format. It may be unclear which references are direct quotes and which are paraphrased. Based on the information provided, the reader would have some difficulty referring back to cited sources. Significant revisions would contribute to the comprehensibility of the paper.

1-Beginning: The stylistic conventions of scientific writing are not followed. Fails to demonstrate thoroughness and competence in documentation. Inappropriate style and format make reading and comprehensibility problematic.

II. Mechanics:

5-Exemplary: In addition to meeting the requirements for a "4," the paper is essentially error free in terms of mechanics. Writing flows smoothly from one idea to another. Transitions

effectively establish a sound scholarly argument and aid the reader in following the writer's logic.

4-Accomplished: While there may be minor errors, the paper follows normal conventions of spelling and grammar throughout. Errors do not significantly interfere with topic comprehensibility. Transitions and organizational structures such as subheadings are effectively used which help the reader move from one point to another.

3-Satisfactory: Grammatical conventions are generally used, but inconsistency and/or errors in their use result in weak, but still apparent, connections between topics in the formulation of the argument. There is poor or improper use of headings and related features to keep the reader on track within the topic. Effective scientific vocabulary is used.

2-Developing: Frequent errors in spelling, grammar (such as subject/verb agreements and tense), sentence structure and/or other writing conventions make reading difficult and interfere with comprehensibility. There is some confusion in the proper use of scientific terms. Writing does not flow smoothly from point to point; appropriate transitions are lacking.

1-Beginning: Paper contains numerous errors in spelling, grammar, and/or sentence structure, which make following the logic of the paper extremely difficult. Scientific terms are misused.

III. Content and Organization:

5-Exemplary: In addition to meeting the requirements for a "4," excels in the organization and representation of ideas related to the topic. Raises important issues or ideas, which may not have been represented in the literature cited. Would serve as a good basis for further research on the topic. Is formatted to peer-reviewed journal appropriate to the field or as a grant proposal to the appropriate funding agency.

4-Accomplished: Follows all requirements for the paper. Topic is carefully focused. Clearly outlines the major points related to the topic; ideas are logically arranged to present a sound scholarly argument. Paper is interesting and holds the reader's attention. It does a credible job summarizing related literature. General ideas are expanded upon in a logical manner thereby extending the significance of the work presented beyond a re-statement of known ideas.

3-Satisfactory: Ideas presented closely follow conventional concepts with little expansion and development of new directions. Certain logical connections or inclusion of specific topics related to the student's area of study may be omitted. Ideas and concepts are generally satisfactorily presented although lapses in logic and organization are apparent. The reader is suitably introduced to the topic being presented such that the relationship to the student's area of study is obvious.

2-Developing: The paper is logically and thematically coherent, but is lacking in substantial ways. The content may be poorly focused or the scholarly argument weak or poorly conceived. Major ideas related to the content may be ignored or inadequately explored. Overall, the content and organization needs significant revision to represent a critical analysis of the topic.

1-Beginning: Analysis of existing scholarly / professional literature on the topic is inadequate. Content is poorly focused and lacks organization. The reader is left with little information about or little understanding of the paper's topic.

IV. Integration and Critical Analysis:

5-Exemplary: The document presents the current state of knowledge for the topic being addressed utilizing a diversity of scientific opinions. These various, and possibly conflicting, opinions are presented in a balanced manner and seamlessly woven together to illustrate a complete grasp of the scientific literature across multiple research approaches utilizing appropriate national and international peer-reviewed journals. Essential findings of multiple sources are accurately and concisely paraphrased, analyzed, and integrated. Original sources are clearly identified and correctly cited in both the body of the text and the reference section. Organizationally, smooth and effective transitions between topics lead the reader through an orderly discussion of the topic being addressed. The gaps in current knowledge are clearly identified and significant directions and approaches that fill these gaps are identified.

4-Accomplished: There are inconsistencies in the organization and logic of the presentation, but still clear analysis of the presented materials. While synthesis of all aspects of the topic may show varying degrees of development, the overall consistency, thoroughness, and analysis result in a well-crafted document.

3-Satisfactory: Identification of key topics or uncertainties in the field may be incomplete. New concepts resulting from a synthetic presentation of ideas is poorly developed or lacking. Complex topics and related concepts are awkwardly presented and linkages among topics may be unclear.

2-Developing: Weakness is evident in the coverage of the field and analysis resulting in incorrect or poorly developed synthesis of results. Analysis is limited to categorizing and summarizing scientific topics. The resulting manuscript significantly degrades the comprehensibility of the document and the identification of knowledge gaps.

1-Beginning: The manuscript contains numerous flaws in the essential components of a literature review. The manuscript lacks a successful synthesis of disparate works, and there is no logical flow to the presentation. These issues result in a manuscript with limited comprehensibility and utility in illustrating the author's effective grasp of the material.