

**Outcome 3: Ability to design and conduct experiments and to analyze and interpret data  
Performance Criteria Scoring Rubrics**

Course: \_\_\_\_\_

Semester taught: \_\_\_\_\_

Type of Student Work Used for Assessment  
(e.g., Homework #4, Exam #2 problem 3, final project): \_\_\_\_\_

Number of students in course: \_\_\_\_\_

Number of students sampled: \_\_\_\_\_

Rating Scale Element	0	Needs Improvement	1	2	Meets Expectations	3	4	Exceeds Expectations	5	N/A
<b>Safe laboratory practice</b>		Does little to follow safety regulations or encourage others to do the same; operates instruments and equipment incorrectly and does not ask for help.			No middle ground!			Is careful to observe and follow good lab practice; is able to operate equipment and instruments easily		
<b>Formulation of an experimental plan to achieve objectives</b>		Does not apply design of experiment; has little understanding of the equipment to be used; applies little or no theory to consideration of experimental design; has only rudimentary understanding of important data needed and how they will be analyzed			Understands the use of design of experiment to acquire data on appropriate variables; may not consider equipment limitations; usually considers existing theory or practice; may not foresee all data needed and may need guidance on modeling and analysis; may need guidance on proper selection of equipment and instruments			Has excellent understanding of design of experiments, includes consideration of equipment limitations & constraints; uses theory and/or practice in experimental design; determines appropriate data to be collected, and models and analysis methods a priori; selects appropriate equipment and instruments		

<b>Conduct of experiment</b>		Does not use design of experiment; is not familiar with equipment; runs experiments without consideration of need for replicates or the possibility of measurement error; little or no data documentation; does not have a realistic sense of measurement error.			Follows design of experiment plan; may be missing replicates or need to go back to repeat experiments, but recognized this; knows general operation of equipment, but may need help; most data and methods are documented; conscious of error in measurement retrospectively.		Follows design of experiment plan, when possible; uses randomized data collection and sufficient replication as appropriate to experiment; operates equipment safely and knowledgeably; documents data; conscious of measurement errors.		
<b>Analysis and interpretation of data</b>		Does not compare data to theoretical models; has no ability to propose other models or relate experimental results to practical issues; provides no realistic reasons for inconsistencies in data.			Compares experimental data and results to appropriate theoretical models; is able to explain observed differences between model and experiment and offer very basic explanations and /or propose other theoretical models; cannot relate experimental results to practical issues		Critically evaluates experimental data and compares results to appropriate theoretical models; is able to explain observed differences between model and experiment and offer explanations and /or propose other theoretical models; is able to relate experimental results to practical issues		