Academic Program:	Physics	**Date:**	August 2, 2022
Author(s):	Joseph West and Jennifer Inlow		
Verify that each of the following documents is correct and current on the ISU Assessment Results Webpage by marking with an "X." Please submit any updated documents and/or corrections as soon as possible to Kelley Woods-Johnson, Assessment & Accreditation Coordinator at kelley.woods-johnson@indstate.edu.		_x__ Learning Outcomes _x__ Curriculum Map __x_ Assessment Plan	
Is this program offered on-campus AND distance? If "Yes," reported data should include students of both, disaggregated.		___ Yes _x__ No ___ Hybrid	

Student Learning Outcomes Assessment Expand table cells as necessary to accommodate requested information.

Learning Outcome(s) Assessed Include actual outcome language; enter one per line, add lines as needed	**Assessment Strategies Used**			**Established Benchmark for Proficiency**	**Actual Student Performance Relative to Benchmark**	**Prior Results for Comparison** (if applicable)
	Course	**Assignment/Activity**	**Evaluation Tool** i.e. rubric, exam key, preceptor evaluation, etc.			
1. Outcome #3: Lab Skills Students pursuing a baccalaureate degree in physics will carry out basic laboratory procedures demonstrating appropriate use of instrumentation, quantitative measurement, and data analysis.	1. Data for these assessments are derived from multiple courses and instructors. Courses that had input in this assessment cycle were PHYS 306, 308L, 315, and 316. They were assessed during the 2020-2021 and 2021-2022 academic years (because we assess Outcome #3 every other year).	1. All physics faculty members complete the "Laboratory Procedures Rubric" based on graded student laboratory reports from PHYS 306, 308L, 315 and 316 and notes/observations made by faculty members concerning the students' laboratory work in these courses. The rubric and summary data are shown in the Appendix submitted with this report.	1. The "Laboratory Procedures Rubric" consists of the following categories: 1) Preparation for Lab; 2) Performance in Lab; 3) Lab Report Writing; 4) Interpretation of Experimental Results; 5) Team Work. The rubric is shown in the Appendix submitted with this report.	1. A score of ≥ 3 in a given category, using a 5-point scale, is considered "satisfactory." We expect ≥ 80% of the students to be rated satisfactory in each category of the rubric.	1. Student performance was "satisfactory" in all 5 categories of the rubric, so our benchmark was met. See Appendix submitted with this report for summary data.	1. Averages for this cycle were slightly higher, overall, compared to the historical running averages. See Appendix submitted with this report for summary data.

2. Outcome #4: Communication Students pursuing a baccalaureate degree in physics will demonstrate professional (a) oral and (b) written communication skills.	2. Data for these assessments are derived from multiple courses and instructors. Assessment was conducted during the 2020-2021 and 2021-2022 academic years (because we assess Outcome #4 every other year). (a) Oral: Courses that had input in this assessment were PHYS 306, 308L, 315, 316, 405, and 499, as well as oral presentations at professional meetings. (b) Written: Upper-division physics courses had input in this assessment.	2. (a) Oral: All physics faculty members complete the "Oral Communication Rubric" based on direct observations of student presentations in PHYS 306, 308L, 315, 316, 405, and 499 and at professional meetings. Included in this assessment cycle were student virtual poster presentations for PHYS 308L in April 2022. (b) Written: All physics faculty members complete the "Written Communication Skills Rubric" based on student writing on laboratory reports, exams, and other assignments from upper-division courses. The rubrics and summary data are shown in the Appendix submitted with this report.	2. The "Oral Communication Rubric" consists of the following categories: 1) Knowledge of Material; 2) Style; 3) Use of Poster/Slides; 4) Ability to answer questions from the audience; 5) Viewability of Poster/Slides. The "Written Communication Skills Rubric" consists of the following categories: 1) Documentation/ Research; 2) Analysis/ Evaluation; 3) Presentation/ Organization 4) Style. The rubrics are shown in the Appendix submitted with this report.	2. A score of $\geq$ 3 in a given category, using a 5-point scale, is considered "satisfactory." We expect $\geq$ 80% of the students to be rated satisfactory in each category of the rubric.	2. (a) Oral: Student performance was "satisfactory" in all 5 categories of the rubric, so our benchmark was met. (b) Written: Student performance was "satisfactory" in all 4 categories of the rubric, so our benchmark was met. See Appendix submitted with this report for summary data.	2. (a) Oral: Averages for this cycle were slightly higher, overall, compared to the historical running averages. (b) Written: Averages for this cycle were slightly lower, overall, compared to the historical running averages. See Appendix submitted with this report for summary data.

Student Success Activities

Use the "Academic Chair" tab in Blue Reports to view your program's data related to retention, persistence, time to/rates of graduation, etc., as applicable (undergraduate v. graduate). Share reflections and activities of program faculty in the table below. Consider curricular, pedagogical, advising, co-curricular, and student support efforts.

Describe current student success activities that are working well.	We provide free walk-in tutoring for freshman-level physics at the Science Help Center. This resource helps ensure the success of Physics Majors through their freshmen course sequence. We provide opportunities for Physics Majors to participate in hands-on research under the direct mentorship of a faculty member during the summer through the Summer Undergraduate Research Experiences (SURE) program, and during the regular semesters for credit (PHYS 399 or 499). Hands-on research is a high-impact experience for students and is one of the most influential factors in determining retention and persistence of students through the four years of their Physics Major. We encourage Physics Majors and Minors to participate in the Society of Physics Students (SPS) (essentially our "physics club"). Participation in this group fosters a sense of community among Physics Majors and gives the students opportunities to interact with the faculty in an informal, small-group setting. They get career and graduate school advice from faculty in such a setting and learn more about the profession of physics. We employ Physics Majors as tutors in the Science Help Center and as lab assistants for introductory-level lab courses. When students have to teach other students as a tutor or in a lab, they learn the material better themselves—this helps solidify their knowledge of fundamental concepts and makes it more likely that they will perform well in their upper-level physics courses. The habits and skills they develop in these settings are also directly relevant to career readiness, for example, communication skills, working with others, content knowledge, and exercising flexibility and adaptability.
Based on Blue Reports data and review of current activities, what are the primary areas to focus on improving next year?	There are no concerning trends in our Blue Reports data. The total number of Physics Majors is small but has remained steady in recent years. We will focus on promoting the student success activities listed above. There may be opportunities to expand the SURE program under the umbrella of the ISU Advantage program. During the past two years we noted a trend of fewer students utilizing the Science Help Center. We will explore ways to promote or advertise the Help Center more widely, or to offer expanded hours.

If you don't have a Blue Reports account, you can request one using the webpage link, or your Department Chair, Associate Dean, or College Assessment Director can assist you.

Continuous Quality Improvement

Describe primary insights gained from analysis of findings. *What was learned? What questions did it raise? How does current performance compare to past (if applicable), and how might any prior action plans have influenced performance?*	Current performance seems to be consistent with prior performance, and remains at a level we deem "satisfactory" using our rubrics. No significant pandemic-related patterns or issues were apparent. There is some evidence that students in this cycle were more comfortable than past students with writing and public speaking, as their scores on style seem to be trending upwards slightly.
What findings-based actions are planned to maintain strong performance and/or improve student learning and success?	Despite the strong overall scores, there is strong evidence that students are still not conversant with the topic of uncertainty to the degree that the Department feels is satisfactory. Recent changes to the sophomore-level curriculum (PHYS 306 and 308L) were partially motivated by

	this concern. These courses have undergone some revision each time they have been offered (incremental, as the pandemic has made the first few offerings less than "regular."). For Fall 2022, additional changes to the PHYS 306 course content will be introduced to add even more emphasis on the topics of experimental uncertainty and error propagation and reporting.
What learning outcomes will your assessment plan focus on next year, and what changes, if any, are planned to improve assessment strategies and yield stronger data?	Our assessment process measures four outcomes, with two measured on alternating years. Next year we will assess Outcome #1 (knowledge of fundamental concepts) and Outcome #2 (problem-solving skills). Given the recent program changes notes above for the sophomore-level curriculum, we are hoping to see improvements in problem-solving skills as a result of these changes. For Outcome #1, the Physics Major Fields Test is used to assess knowledge of fundamental concepts; at this point enough data has accumulated for the national level test to begin reporting scores with the new test and scoring formats. We anticipate comparing our students' performance to this new national data.
Describe faculty involvement in this assessment, and how will findings be shared with faculty/stakeholders (as applicable)?	All members of the Physics Faculty participate in evaluating student performance each year as follows: Student lab reports are made available for everyone to review, and many of the lab classes are actually team-taught so multiple faculty members have the opportunity to observe students in a given course setting. Student presentations are required at the end of the semester in PHYS 308L, 315, and 316—all Physics Faculty attend these presentations and evaluate the students. Student presentations for PHYS 405 and 499, as well as at external research conferences, are evaluated by as many Physics Faculty as are able to attend. Information contained in this assessment report will be discussed at a departmental faculty meeting in Fall 2022. Feedback from the Office of Assessment will also be discussed by the Physics Faculty. This report and appendices will be posted on our departmental Canvas site so all Physics Faculty can review it at any time.

Data for Physics 2021-22 Student Outcomes Assessment

Summary Data for Academic Years 2020-21 and 2021-22

Outcome #3: Lab Skills

Laboratory Skills	Preparation for Lab	Performance in Lab	Lab Report Writing	Interp. Of Exp. Results	Team Work
Totals	76	82	71	65	63
Averages	4.22	4.56	3.94	3.61	4.50
St. Dev.	0.73	0.62	1.00	0.85	0.55
N < 3	0	0	1	1	0
%N < 3	0.0	0.0	5.6	5.6	0.0
N scores	18	18	18	18	14

Outcome #4: Communication

Oral Communication	Knowledge of Material	Style	Use of Poster/Slides	Ability to Answer Qs	Viewability of Poster/Slides
Totals	74.6	81.2	85.5	78	87.8
Averages	3.73	4.06	4.28	3.90	4.39
St. Dev.	0.70	0.76	0.64	0.91	0.54
N < 3	0	0	0	1	0
%N < 3	5.0	0.0	0.0	0.0	0.0
N scores	20	20	20	20	20

Written Comm. Skills	Documentation/ Research	Analysis/ Evaluation	Presentation/ Organization	Style
Totals	79.6	76.1	79.8	85.1
Averages	3.98	4.01	3.99	4.26
St. Dev.	0.85	0.93	0.64	0.53
N < 3	0	2	0	0
%N < 3	15.0	15.8	0.0	10.0
N scores	20	19	20	20

Historical Average Data NEXT PAGE

Historical Average Data (Includes 2020 – 2022 data)

Outcome #3: Lab Skills

Laboratory Skills	Preparation for Lab	Performance in Lab	Lab Report Writing	Interp. Of Exp. Results	Team Work
Totals	636	699.8	647.7	627.5	704
Averages	3.79	4.17	3.86	3.74	4.32
St. Dev.	0.95	0.77	0.86	0.92	0.76
N < 3	14	2	8	16	5
%N < 3	8.3	1.2	4.8	9.5	3.1
N scores	168	168	168	168	163

Outcome #4: Communication

Oral Communication

Oral Communication	Knowledge of Material	Style	Use of Poster/Slides	Ability to Answer Qs	Viewability of Poster/Slides
Totals	721.6	752.2	759.5	721	794.8
Averages	3.88	4.04	4.08	3.88	4.27
St. Dev.	0.87	0.78	0.71	0.83	0.67
N < 3	12	1	2	10	1
%N < 3	6.5	0.5	1.1	5.4	0.5
N scores	186	186	186	186	186

Written Communication

Written Comm. Skills	Documentation/ Research	Analysis/ Evaluation	Presentation/ Organization	Style
Totals	633.9	634.1	645.3	669.6
Averages	3.84	3.80	3.84	3.99
St. Dev.	0.92	0.93	0.84	0.77
N < 3	14	13	8	4
%N < 3	8.5	7.8	4.8	2.4
N scores	165	167	168	168

Student Outcomes Assessment & Success Report Evaluation AY 21-22

Program: Physics

Evaluation:

The purpose of SOAS Report evaluation is to promote high quality academic program assessment that results in relevant, useful, and accurate data about student learning outcome achievement that faculty can use in planning for and monitoring efforts toward continuous improvement. Faculty are encouraged to incorporate feedback they find useful into assessment practices, and resources are available to support assessment development.

Evaluation Key: Exemplary=Meets all standards, exceeds some; Mature=Meets all/most standards, no serious concerns; Developing=Meets some standards, multiple recommendations for improvement; Undeveloped=Meets few/no standards, serious concerns noted; Cannot Evaluate=Missing information prevents evaluation

Component of Practice	Areas of Exemplary Practice	Standards of Practice Highlighted practices were clear in the SOASR	Recommendations for Improvement (serious concerns highlighted)	Evaluation Relative to Standards
Learning Outcomes Strong learning outcomes use language that focuses on what students will achieve and can be measured to demonstrate achievement.		At least one outcome is assessed this cycle Outcome(s) is specific as to what students will be able to know/do as a result of their learning Outcome(s) is measurable Outcome(s) is consistent across modes of delivery (if applicable)		Mature
Assessment Strategies Strong assessment strategies are designed to produce data of high enough quality to be useful to faculty trying to understanding student learning outcome achievement, uncover potential issues, and determine next steps to support continuous improvement. They do not rise to the rigor of research methods, though they may draw on some related tenants and strategies.	Excellent use of multi-year data to capture student performances beyond a single cohort or single point in time to provide a more accurate representation of mastery. Excellent use of multiple assignments in multiple courses to demonstrate learning across the curriculum and in various relevant activities.	Assessment measure(s) is designed for precise alignment to designated outcome(s) Overall assessment strategy relies primarily on direct assessment measure(s) Indirect assessment measure(s) is included to provide supplemental perspectives Assessment data comes from multiple sources, either within a significant course or across the curriculum Assessment measures include rich and/or relevant displays of student learning (i.e. experiential learning, intensive writing, problem-based learning, licensure exams, etc.) Tools for evaluating student achievement are clearly described when necessary (i.e. rubrics, exam alignment key, preceptor evaluation, etc.)		Exemplary

Results & Analysis Clear depiction of results and strong analysis pairs with strong assessment strategies to allow faculty to determine appropriate interpretation of data and use of findings. Use of student achievement data rather than anecdotes, comparison to thresholds of proficiency, and thoughtful use of disaggregation to uncover potential group differences that might exist are all good practices.	Thoughtful analysis of student performance includes notes of faculty insights not readily apparent in the data but notable on observation. This is so useful because assessment findings are inherently limited by the design of the assessment. They won't always capture every aspect of mastery that interests the faculty or that couldn't be foreseen.	The threshold for proficiency for each outcome is clearly stated relative to the measure/evaluation tool used The threshold for proficiency reflects reasonably high expectations for the program Actual student performance data on assessment measures is shared relative to the stated threshold for proficiency and (when applicable) the evaluation tool used Thoughtful discussion of faculty insights gained from findings is included When appropriate, student performance data is disaggregated by group, without identifying any specific student (ex: on-campus & distance cohorts in a program offering both forms of delivery) When applicable, missing data or significant limitations to how data may be interpreted or applied are described		Exemplary
Continuous Improvement Assessment is about sharing and use of results to celebrate strong performance and improve in intentional ways. Assessment for continuous improvement includes engaging multiple faculty in assessment, comparing prior results to current results to examine our interventions, using findings to plan for the future, and sharing what we have learned.	Excellent incorporation of faculty throughout the program in the assessment process. It is evident that the Physics faculty focus on understanding student learning, responding as needed, and using the assessment process to simplify quality data collection for these purposes.	Multiple program faculty are involved in the assessment process Plans for maintaining strong performance and/or improving student learning are clearly driven by assessment findings Plans for maintaining strong performance and/or improving student learning are within reasonable purview of program faculty If data from prior assessments is provided, reflection on changes over time and the possible impact any prior interventions is discussed A commitment to ongoing assessment is demonstrated in clear plans for upcoming assessment Assessment findings are shared with program faculty and any applicable stakeholders	Consider if refining the "Knowledge" section of the communication rubric/evaluation tool to include aspects of communication like discussing uncertainty would help provide more nuanced data about students' abilities. This may not be necessary given the recognition of this concern among faculty, but may be a useful tool if trying to capture data and evidence change.	Exemplary

Contact Kelley Woods-Johnson at kelley.woods-johnson@indstate.edu or x7975 with questions or for support.