Annual Assessment Report 2020-2021

BS Physics and Astronomy

Physics and Astronomy

College of Science

CONTACT

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DISCIPLINARY ACCREDITATION Yes

DEVELOPMENT AND DOCUMENTATION OF STUDENT LEARNING OUTCOMES

How were the program's SLOs developed? (select all that apply)

- Our disciplinary accrediting agency has recommended learning outcomes, so we used and/or modified them.

Other than the CPP Catalog and the Office of Assessment and Program Review website, where else are your SLOs published? Select all that apply.

- Department Website - provide URL:https://www.cpp.edu/sci/physicsastronomy/about/program-assessment.shtml

ASSESSMENT ACTIVITIES IN 2020-2021

This section provides the opportunity for programs to share and discuss assessment activities conducted in **AY 2020-2021.** This includes data collection, rubric development, data analysis, discussion of findings, development or implementation of closing the loop improvement strategies, update of your assessment plan and/or curriculum matrix, etc.

How many total SLOs does your program assess according to your assessment plan?

- 7

How many SLOs did your program assess this past year in 2020-2021?

- My program assessed SLOs in AY 2020-2021 .

Please list the SLOs examined

- SLO #1: Students will be able to apply equations and foundational theories when modeling a system with quantitative reasoning
- SLO #2: Other than the SLOs, we also gave a separate survey about online teaching to different classes taught at the department.

Student Learning Outcome (SLO)	Assessment Activities	Evidence Used	Evaluation and Interpretation of Evidence	Findings			
				N of Artifacts	Criterion Used	Goal Met	Eye-opening Result
SLO 1: Students will be able to apply equations and foundational theories when modeling a system with quantitative reasoning	Created/modified/discussed assessment procedures (e.g., SLOs, curriculum matrix, mechanism to collect student work, rubric, survey, etc.)						
	-Collected direct evidence (e.g., student work, exam items, etc.) -Scored direct evidence of student learning	Assignment/exam/paper completed as part of regular coursework	-Scored exams/tests/quizzes -Used a rubric or scoring guide -Used professional judgement (no rubric or scoring guide used)	29	Based on research literature, we developed a rubric to assess SLO1: Students will be able to apply equations and foundational theories when modeling a system with quantitative reasoning. This rubric has 4 categories (namely, activation, construction, execution and reflection), each category is scored from 0-3. We looked at the results using two ways: the distribution of counts	As mentioned previously, the average score of all four categories is somewhere around 2 points (minor mistakes). More than a third of the students got 3s (highest score) in all categories. So we believe that for this subset of students, they really hit the home run on this question in all aspects. There is possibly a self-selection bias. Since students were given a	The assessment problem asks students to solve the problem using a different method and check if the results match. This is a pretty standard thing physicists do and we also do this several times in class. The two methods are “Direct integration

					in each bin (0-3), as well as the average score for each category. The average score of all four categories is somewhere around 2 points (minor mistakes). More than a third of the students got 3s (highest score) in all categories. Students score on the reflection category is relatively lower (1.7). This skill does require more deliberate practice and we encourage that instructors prompt students to do that as much as possible in the class. In the future, we could choose to evaluate this SLO in another class, or to evaluate another aspect of SLO (for example, real world application) in the same class.	choice to select 2 out of 3 problems to solve on the exam, the fact they chose this problem shows that they know they can do this problem better. This is probably partially the reason of more than a third of the perfect scores we saw. We believe that overall, our program meets its goal. But there are places for future improvements. First of all, in future assessment, we could get a more holistic view by asking students to solve all the problems, this can help eliminate the selection bias (if any). Secondly, students scored relatively lower on one of the categories: “reflection of the results” with an average score of 1.7. This is not	using the potential definition” and “Multiple expansions”. The use of Taylor expansion is just a mathematical treatment to the direction integration result. I am surprised to see many students treat the “Taylor expansion” as a standalone method. In the future, instructors can point out more explicitly what a physics method is and how that differs from using a mathematical tool.

						surprising as being able to reflect on the results is a high level of problem-solving and is an ability physicist develop over time. This skill does require more deliberate practice and we will recommend to instructors to prompt students to do that as much as possible in the class. Last but not least, we found out that for students who scored low on this question, they tend to score low on all (most of) the categories. Perhaps on future assessments, we could give more opportunities to students who score low to demonstrate and showcase what they do know about the problem. For example, if students can't do the execution of the mathematics	

						very well, but they have a good idea about what physics principle is involved, and we would love to see that is the case.	
	-Discussed assessment results to make program decisions to improve SLO achievement (e.g, design new course, modify assignments, etc)						

Student Learning Outcome (SLO)	Assessment Activities	Evidence Used	Evaluation and Interpretation of Evidence	Findings			
				N of Artifacts	Criterion Used	Goal Met	Eye-opening Result
Other than the SLOs, we also gave a separate survey about online teaching to different classes taught at the department.	Created/modified/discussed assessment procedures (e.g., SLOs, curriculum matrix, mechanism to collect student work, rubric, survey, etc.)						
	-Collected indirect evidence (e.g., surveys, interviews, focus groups, etc.) -Scored indirect evidence of student learning	-Student survey/interview/focus groups with self reports of SLO achievement		331	All classes were taught online due to the pandemic. In fall 2020, we gave an additional survey (on top of the SLO assessment) to students who are taking virtual online physics classes. We believe it is a nice addition to the regular assessment on SLOs for this special time. The survey was shared with all the instructors and a subset of them gave the survey to their students. We collected data on a variety of courses	Overall, students were positive and appreciative about the efforts the faculty made to accommodate them in this most unusual semester. Some responses mentioned the professor's names and said they are very helpful. Students rated the most useful strategies as: • Use of	It was eye-opening to see that the zoom breakout rooms were not ranked higher than what it is. It is still not bad (60% of the students said it was either somewhat useful or very useful). We had thought that for virtual learning, the collaboration and interaction part was

					from introductory physics to upper-division courses. One survey item asked students to rank to which various strategies helped or hindered their learning. Students responded to the question and chose from the Likert scale options from the very useful (5) to not at all useful (1). We analyzed our data two ways: 1) We plotted the distribution of bins (from very useful to not at all useful) for each teaching element/strategy. 2) We also ranked the various teaching elements/strategies according to the percentages of students who choose 5s and 4s&5s combined.	multimedia such as short films / Youtube videos • Working with a study group • Personal check-ins from the instructor outside of assignments • Synchronous, online lectures that did not require interaction • Working in small groups in “zoom break out rooms” • Use of web-based interactive assignments • Use of polls or clicker-type questions within lectures The percentage of students who choose (4s and 5s, Somewhat useful and Very useful) for the above	really missing compared to the actual classroom, so students probably would really appreciate being able to break out into smaller rooms. We think the reason for the less than satisfying result for zoom breakout rooms was the execution rather than the idea itself. Sometimes some students step away from their computer, so people who share the same breakout room with them are stuck with

						teaching strategies is around 70%. Even for the lowest ranking strategies, the percentage is 51%, so still a half of the students think the teaching strategy is either somewhat useful or very useful. We believe this is satisfying results for our virtual learning.	someone who is not responsive. So it really require the instructors to be more attentive in assigning breakout rooms, reminding students to be focused during synchronous class time, and making sure students who don't have a functional breakout room know how to reach out to instructor and get the issue taken care of.

IMPROVING THROUGH ASSESSMENT

Overall, what best describes how the program used the results in 2020-2021? Select all that apply.

- Results indicated no action needed because students met expectations
- Other, please explain: There is always improvements that can be made. For the assessment done in the individual faculty's class (in this case, i collected data from my own class), I could make future teaching adjustment based on my assessment results. But to make department level changes, more faculty discussions are needed.

Ideas to improve student learning can come from different constituents. With whom did the program discuss assessment planning and/or share results during AY 2020-2021? Select all that apply.

- Program/department faculty as whole
- A committee of program/department faculty
- Program/department assessment committee
- College assessment committee
- Other, please explain: CEMaST brownbag seminar, attended by people across the college of science.

The past academic year posed both challenges and opportunities. Please share any assessment discoveries (e.g., insights about assessment procedures, great achievements, etc.) regarding program assessment in 2020-2021 so that others may learn from your experiences.

Despite the challenges of virtual learning, we were still able to collect data and complete assessment on one SLO. We are proud that we took a research-based approach (with the lead faculty being a physics education researcher) to our assessment. We developed our rubric based on known literatures. In addition, we also collected a lot of data on students' experience with online teaching and learning. I believe it was very informative and necessary for this special time. We are proud to find out that overall, students were positive and appreciative about the efforts the faculty made to accommodate them in this most unusual semester. Some responses mentioned the professor's names and said they are very helpful. Even the lowest ranking teaching strategies have a high percentage of 4s and 5s (where students find it useful).

CPP's GI2025 goals focus on eliminating equity gaps. What plans do you already implement, or would implement to support the campus' diversity, equity, and inclusion (DEI) efforts? (e.g., planned or current disaggregation of assessment data by race/ethnicity, etc.)

We found out that for students who scored low on this question(where SLO1 was assessed), they tend to score low on all (most of) the categories. One thing that can be done on a smaller scale (we can make recommendation to faculty) is that on future assessments, we could give more opportunities to students who score low to demonstrate and showcase what they do know about the problem. For example, if students can't do the execution of the mathematics very well, but they have a good idea about what physics principle is involved, and we would love to see that is the case. We believe this could help with the bigger goal of diversity, equity, and inclusion (DEI) efforts. A departmental level discussion is needed to make further steps towards the goal of eliminating equity gaps.

The most current assessment plan and curriculum matrix we have on file for your program may be found here. To ensure we have the most updated assessment plan and curriculum matrix for your program, and for posting on our website, please upload the following documents:

Assessment Plan Yes

Curriculum Matrix Yes

If you would like us to review other assessment documents such as your evidence (e.g., assignment, survey, interview questions etc.) or scoring rubric, please upload/provide them. (Select all that apply)

- Other: Everyhing is in one file