PROGRAM REVIEW Fall 2021

Program: Physics and Astronomy
Division: STEM
Date: Sep 29, 2021
Writer(s): Robin Rehagen & Eric Harpell
SLO/SAO Point-Person: Robin Rehagen

Audience: Deans, Vice Presidents of Student Services and Academic Services, All Planning and Allocation Committees. This document will be available to the public.

Uses: This Program Review will be used to inform the campus and community about your program. It will also be used in the processes of creating Division Summaries, determining College Planning Priorities and allocating resources. A final use is to document fulfillment of accreditation requirements.

Please note: Program Review is NOT in itself a vehicle for making requests. All requests should be made through appropriate processes (e.g., Instructional Equipment Request Process) or directed to your Dean or supervisor.

Time Frame: This Program Review should reflect on program status during the 2021-22 academic year. It should describe plans starting now and continuing through 2022-23.

Sections: There are three sections to this document. Sections and questions identify the name of the committee or office that will use the information and where you can get additional help.

- The first section focuses on general program reflection and planning.
- The second section is a review of curriculum, to be filled out only by programs with curriculum.
- The third section is a review for CTE programs, to be filled out only by these programs.

Topics: The Program Review Glossary defines key terms. Writers should review this glossary before writing: https://bit.ly/2LqPxOW

For Help: Contact Nadiyah Taylor: ntaylor@lapositascollege.edu.

A list of contacts for help with specific sections is provided on the Program Review website under the "tools for writers" tab. [https://bit.ly/3fY7Ead]

Instructions:

1) Please respond to each question with enough detail to present your information, but it doesn't have to be very long.
2) If the requested information does not apply to your program, write "Not Applicable."
3) Optional/suggested: Communicate with your dean while completing this document.
4) Send an electronic copy of this form to Nadiyah Taylor and your dean by when?

Links:

Program Review Home Page
Fall 2020 Program Reviews
Frequently Asked Questions

Section One: Your Program In 20-21 – Please check N/A where relevant

A. Accomplishments: How did your Program's accomplishments during AY20-21 support the newly revised college mission, the goals of the Educational Master Plan, and/or the President's Call to Action on anti-racism? *Areas to consider include impacts to students by race/ethnicity, gender, sexuality, age, or disability status, or those disproportionately impacted by the shift to remote instruction and services.*

- *College Mission*
- *Educational Master Plan*
- *Presidential Task Force: Call to Action*

Description	Mission	Master Plan	Presidential Task Force
1 – We developed new curriculum for at-home labs, including the use of online physics simulations and the design and distribution of take-home laboratory kits. We moved as many lab classes as possible to on-campus/hybrid classes when the option became available. This supports the college's mission to keep students on track to earn their degrees in spite of the pandemic and mandated online classes.	x		
2 – We updated curriculum as part of the 5-yr cycle, which ensures the continued articulation of our courses and students' ability to transfer.	x		
3 – We expanded summer course offerings to include an online ASTR 30L lab which allows students to earn tranferrable GE science lab credits over the summer, helping speed along their progress towards their degrees.	x		
4			
5			
6			

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B. Challenges, Obstacles and Needs: What significant challenges or obstacles did your Program face during AY20-21 in supporting the newly revised college mission, the goals of the Educational Master Plan, and/or the President's Call to Action on anti-racism? *Areas to consider include impacts to students by race/ethnicity, gender, sexuality, age, or disability status, or those disproportionately impacted by the shift to remote instruction and services.*

_____N/A

Description	Mission	Master Plan	Presidential Task Force
1 – Facilities: Our student enrollment continues to increase, even through the pandemic, and we need a second, dedicated physics laboratory classroom. We can no longer fit into the single physics lab room and have been sharing room 1822 with engineering. The engineering program is also	x		

increasing in size, and scheduling laboratory space so that there is no overlap between departments is difficult and not sustainable. Adequate lab space would ensure that we can continue to support the educational and transfer needs of students.			
2 – Facilities: We need increased storage space for laboratory equipment. Adequste storage space would ensure that we can continue to support the educational and transfer needs of students.	x		
3 – Facilities: We need a vehicle-accessible Dark Sky Site and Storage Shed for telescopes. The current telescope dome is unusable with the lights from the nearby athletic fields. While building a new telescope dome may be impossible, an easier task would be to simply pave a road to a dark location in the hills surrounding campus, and build a small storage shed at the site to store the telescopes. For telescope safety, the storage shed should be locked and temperature controlled (ex: a solar-powered fan and mesh windows) so that summer heat does not destroy the telescopes. As it is currently, damage to the telescopes is a constant danger during transportation from the current place of storage on campus. A dark sky site would ensure that we can continue to support the educational and transfer needs of students.	x		
4			
5			
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C. Planning: What are the most important plans, either new or continuing, for your Program?
_____N/A

Plan	New	Continuing	Short term	Long term
Addressing the facilities needs as described in the previous section		x		x
Ensuring that both online and face-to-face classes are designed with equity and access in mind		x	x	x
Advising all faculty to discuss and reiterate study skills specific to physics, and to direct students towards college resources (tutoring center, math jam, ILC for math, etc.)		x	x	x

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D. How have your program's interactions with the larger campus systems benefitted your students? For example, working with allocation committees, participation on committees, etc.
_____N/A

Campus system or Committee	How has it benefitted your students?
Engineering Technology Interdisiplnary Program	Since Physics 10 and Physics 10L are requirements for the engineering tech program, both faculty have worked with the Engineering Technology advisory board at Las Positas and Lawrence Livermore Labroatory to support the academic and career needs of our students.
Scholarship Committee	Eric Harpell is chair of the STEM scholarship subcommittee, and has helped students by providing updates and encouragement about applying for scholarships. Many students have ultimately received scholarships that lessen the financial burdon of a four year edication in STEM related fields.
SLO Committee	As department SLO coordinator and member of the SLO committee, Robin Rehagen has ensured that physics and astronomy SLOs reflect the goals of physics education, ensuring continuity and rigor thoughout our offerings and allowing us to analyze student learning among different demographic catgories.

E. If you have outreached to students in your department, program or classes, please share information about what you discovered and how you have used the feedback

_____N/A

Describe student outreach used to gather feedback? For example, through surveys, conversations, etc.	We consistently poll physics students each semester to see how many plan to continue throughout the next course in the physics sequence.
What did you learn?	We learn which students plan to take each physics course, and which order they plan to take the courses in.
How will you use the feedback?	We use this information to help us schedule the appropriate number of class sections each semester.

Section Two: Data Analysis – Quantitative and Qualitative

A. IR Data Review: Describe any significant trends in your program's data provided by the office of Institutional Research and Planning. (Note: Not all Programs have IR data available; if your program does not have a data packet or dashboard data, you may note that in the

response box.) You may also discuss any other data used by your program for decision-making and planning.

- IR Data packets are available here: https://bit.ly/2IYaFu7 - will be updated with fall 21 data

- Course Success Rates Dashboard can be found at the bottom of this page: https://bit.ly/2Y9vGpl

- Total physics enrollment has gone up starting in 2019, and this increase continues through the pandemic (we are seeing increases in enrollment by 12-20% compared to Fall 2019, even during the pandemic!).
- With the exception of the Spring 2020 semester when the pandemic was first announced, physics course withdrawl rates and course grade distributions have remained roughly constant. Looking at the course success rates broken down by individual course, there are a handful of courses where the online modality correlated with an increased number of withdrawls/non-success compared to previous semesters, but this is possibly stochastic variation among the student population due to the small size of our program. *(Anecdotally, many physics faculty members feel student understanding of material has been poorer in the online environment, which may be a factor leading to more withdrawls and failing grades.)* But the IR data show that (averaged over all courses) withdrawls and course grades seem to be relatively unaffected by online modality.
- There are no significant changes in age demographics of physics students.
- Over the past 5 years, the percentage of Asian students has increased by 50% and white students decreased by 25%. This means that five years ago, physics classes contained half as many Asian students as white students. Now, the racial demographics are about equal, with a slightly higher percentage of Asian students. Other racial demographics are relatively unchanged. (*It would be interesting to know if this was due to physics students coming to LPC from different geographic areas, or if this is due to gradual shifts in the demographics of Livermore/Dublin/Pleasanton/Tracy. Our guess is the latter, but the IR data do not provide this information.)*
- Most physics students (pre-COVID) took only face-to-face classes. Obviously, that changed significantly during COVID.

B. Program-Set Standard (Instructional Programs Only): The program-set standard is a baseline that alerts programs if their student success rates have dipped suddenly. There may be many valid reasons a program does not meet the Program Set Standard; when a program does not meet this standard, they are simply asked to examine possible reasons and note any actions that should be taken, if appropriate.

Program-set standard data can be found on this page:

- *Did your program meet its program-set standard for successful course completion?*
  __x__yes _____no

- *If your program did not meet your program-set standard, discuss possible reasons and how this may affect program planning or resource requests.*

SLOs/SAOs:

For assistance with these questions, contact the SLO Committee Chair. [https://bit.ly/3fY7Ead]

Each year programs must discuss how their PSLOs, CSLOs, or Service Area Outcomes (SAOs) support the College Mission. This helps us to see how our students are progressing in their learning.

You should complete ONE of the following three sections. Please choose the option that is most appropriate for your program:

C1: Instructional Programs with PSLOs
C2: Instructional Programs without PSLOs or with Special Circumstances
C3: Non-Instructional Programs

Go directly to the section you chose. If you are not sure which option to pick, contact the SLO Committee Chair or Program Review Committee Chair for assistance.

C1: Instructional Programs with PSLOs

PSLO Assessments:

(1) Please list the PSLO(s) that were reviewed in this last cycle and explain why these were chosen.

Upon successful completion of an AS in Physics, students are able analyze physical situations quantitatively using fundamental physics principles, ranging from Newtonian mechanics to modern physics.

(2) What percentage of faculty completed the planned assessments? (run Faculty Participation report from last year). ____87.5_____%.

Everyone participated except one person who forgot to input scores during one semester. So I will give a percentage of courses assessed: 14 out of 16 lab sections were assessed: 14/16 = 87.5%

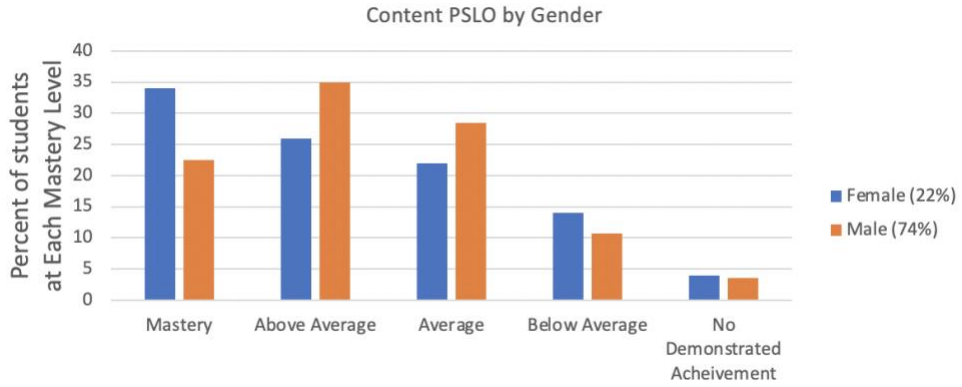
(3) Did you get the assessment data that you needed to complete this report? If not, then describe the barriers that you can identify. ___x___YES _____No

Yes. We still had data from over 700 students and were able to run a meaningful analysis.

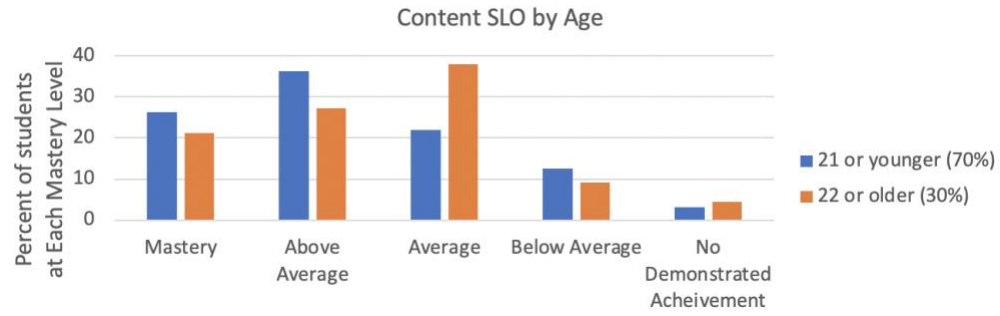
(4) Discuss the findings of the PSLO(s) that were up for review last year (according to your 3-year planning template). What conclusions can be drawn about student learning?

The SLO focused on students' ability to apply basic physics principles to solve problems, and most faculty assessments were based on student exam performance. When we disaggregated the data based on different demographics, we found:

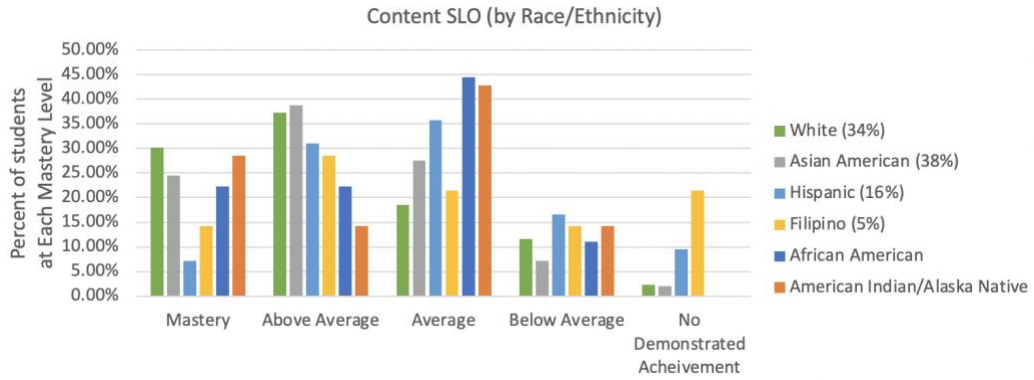
- Women outperformed men on exams (see chart below). This is typical for LPC physics classes (we have seen this trend over the past 6 years) but usually the discrepancy is only 2-3% higher for women.



  - We believe the most likely reason for the discrepancy is due to small sample size (only 50 women) and is not a significant long-term trend.
  - If the discrepancy is real, it might be due to online classes this past year (it's possible women adapted to the online environment better than men) or possibly to the hire of an additional female faculty member this past year.
- Older students outperformed younger students by about 5% (see chart below).

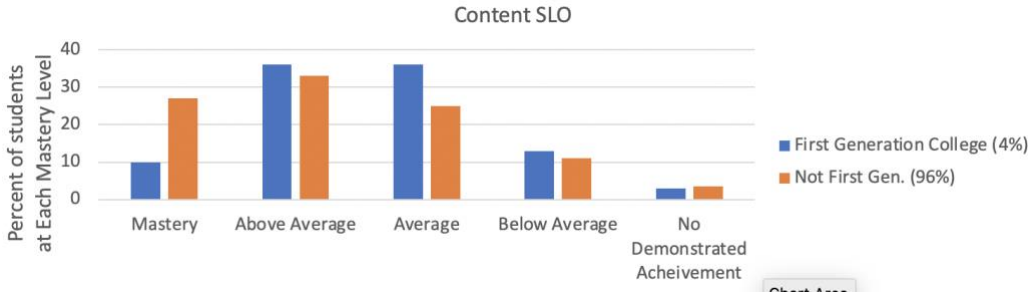


  - This distribution is typical to what has been seen in past years (pre-COVID).
  - This trend seems to defy understanding, as most faculty report anecdotally that older students are typically more motivated and organized than younger students. It's possible that there are two separate populations of older students (those who have returned to college after starting jobs and families who are motivated and organized, and those who are older because they are taking longer to complete their degrees due to lack of motivation/organization). We are unsure as to how to interpret these results as we cannot distinguish between these demographics.
- Performance on physics exams is correlated with race/ethnicity (see plot below).



- These trends are similar to what has been seen in the past 6 years. White and Asian students make up the majority of our student population (>70%) and follow the expected bell curve. Hispanic and Filipino students (~20%) show fewer As (mastery) and more Cs/Ds/Fs. The other demographics represent such a small number of students that the results are not statistically meaningful.

- First-generation college students earned lower SLO scores (see plot below).



- Many STEM majors (computer science, engineering, and physical sciences) require this calculus-based physics sequence. According to these data, very few students taking our calculus-based physics sequence fall into the first-generation college category (only 30 out of nearly 700).
- However, of those students, 17% fewer obtained a mastery score. This demographic has not been studied previously, so it is unknown whether or not this trend is real, or due to small sample size.

(5) Was the data disaggregated and, if so, on what parameters? What, if any, equity issues emerged?

Yes. We disaggregated on gender, age, race, and first-generation college students. See the discussion above.

(6) List changes that you plan on making to improve student learning and address inequities.

The main points of concern were the lower SLO performance of the Hispanic/Filipino population and the first-generation college students. We believe this lower performance may be due to several possible factors, many of which are broadly applicable even outside these particular demographic groups:

- Socioeconomic factors (possibly exacerbated by COVID, although the demographic trends were seen before COVID)
- Poor study skills: Many students do not know how to effectively study physics. Study skills that may have worked for other classes do not necessarily work for physics classes.
- Poor course preparation: some students have trouble using algebra and calculus techniques that should have been mastered during course prerequisites.

As a department, we discussed that in order to address this equity issue we will:

- Make it a point to direct students towards on-campus resources that help with math and physics (Tutoring center, Math ILC, etc.)
- Stress and consistently reiterate effective study habits, and explain how studying for physics differs from other disciplines
- Modify homework grading policies to support learning and practice, rather than getting students focused on "points" which encourages cheating
- Encourage students to solve homework problems together in groups (this has been very difficult during COVID, but hopefully will become easier with the reopening of the tutorial center)
- Some faculty were interested in holding a SmartShop for PHYS 2A-2B students to review basic algebra and trigonometry

(7) Discuss the challenges, if any, to improving student learning and equity. You may refer back to items listed in Section 1B.

Many of the suggestions listed in the question above can be done by individual faculty within their physics classes. However, student math preparation is difficult for us to address, because students are assumed to have mastered the material from the math prerequisite courses. We can always help students with math review who come to us on an individual basis, but we would request that math courses maintain rigor and find ways to ensure that students are truly mastering the material in the online environment. Specifically, this semester there were multiple students across both PHYS 1A sections (who have passed Calculus 1) who were unable to perform basic algebraic manipulations (i.e., "solve for x") or take simple derivatives.

(8) Are you planning on revising on your 3-year planning template? If so, describe.
_____YES ____x____No

C2: Instructional Programs without PSLOs or with Special Circumstances

CSLO Assessments:

Student Learning

(1) List the CSLO(s) that were up for review last year (according to your 3-year planning template) and explain why your department selected these CSLOs for review.

(2) What percentage of faculty completed the planned assessments? (run Faculty Participation report from last year). _____%

(3) Discussion-based analysis of student learning: Using the CSLO data and answers to the reflection questions, what type of conclusions can be made about student learning?

(4) Describe the pertinent findings. What, if any, equity issues emerged?

(5) List changes that you plan on making to improve student learning.

Assessment Process: To be completed by the department/program or the SLO Coordinator

(1) List changes that you plan on making to improve student learning and address inequities.

(2) Discuss the challenges, if any, to improving student learning and equity. You may refer back to items listed in Section 1B.

(3) Are you planning on revising your 3-year planning template? If so, describe.

_____YES _____No

C3: Non-Instructional Programs

SAO Assessments:

Support of Student Learning

(1) List the SAO(s) that were up for review last year (according to your 3-year planning template) and explain why your department selected these SAOs for review.

(2) What percentage of faculty completed the planned assessments? (run Faculty Participation report from last year). _____%

(3) Discussion-based analysis of student learning: Using the SAO data and answers to the reflection questions, what type of conclusions can be made about student learning?

(4) Describe the pertinent findings. What, if any, equity issues emerged?

(5) List changes that you plan on making to improve student learning.

Assessment Process: To be completed by the department/program or the SLO Coordinator

(6) List changes that you plan on making to improve student learning and address inequities.

(7) Discuss the challenges, if any, to improving student learning and equity. You may refer back to items listed in Section 1B. Are you planning on revising on your 3-year planning template and, if so, describe?

(8) Are you planning on revising on your 3-year planning template? If so, describe.

_____YES _____No

Program Review Suggestions (optional): What questions or suggestions do you have regarding this year's Program Review forms or process?

Section Three: Curriculum Review (Programs with Courses Only)

For assistance with this section, contact the Curriculum Committee Chair. [https://bit.ly/3fY7Ead]

The following questions ask you to review your program's curriculum. To see the last outline revision date and revision due date:

1. Log in to CurricUNET
2. Select "Course Outline Report" under "Reports/Interfaces"
3. Select the report as an Excel file or as HTML

A. **Title V Updates [Curriculum Committee]: Are any of your courses requiring an update to stay within the 5-year cycle? List courses needing updates below.** *Reminder: updates to course title or units, and course deactivations, will require updating any program they are associated with. List programs requiring updating in question (B).*

____x__YES _____No

Course Name & Number
PHYS 1A, PHYS 1B, PHYS 1C
ASTR 10, ASTR 20
PHYS 2A, PHYS 2B

B. **Degree/Certificate Updates [Curriculum Committee]: Are there any programs requiring modification? If yes, list them below.**

_____YES _____x___No

Certificate or Degree

C. Are there any courses or programs for which a non-mandatory update is planned?

_____YES _____x_____Not at this time

If yes, explain details, rationale, or any support that might be helpful

D. Does your program plan to create any new courses or programs this year?

_____YES _____x_____No

If yes, please provide details and the rationale

Section Four: CTE Updates

(CTE Programs Only)
Vicki Shipman will provide you with or support any data needs

A. Labor Market Conditions: Examine your most recent labor market data (within the last 2 years).

1) **Does your program continue to meet a documented labor market demand?**
_____YES _____No

2) Does this program represent a training need that is not duplicated in the college's service area?
_____YES _____No

Please explain

B. Advisory Boards: Has your program complied with advisory board recommendations?
_____YES _____No

If not, please explain.

C. Strong Workforce Program Metrics: Utilizing LaunchBoard, review the Strong Workforce Program Metrics. Review the data and then answer the following questions.

C1. Does your program meet or exceed the regional and state medians **for increased enrollments, completions, and/or transfer since your last program review**?

_____YES _____No

If not, what program improvements may be made to increase this metric?

C2. Does your program meet or exceed the regional and state medians **for students gaining employment in their field of study**?

_____YES _____No

If not, what program improvements may be made to increase this metric?

C3. Does your program meet or exceed the regional and state medians **for student employment rates after leaving the college**?

_____YES _____No

If not, what program improvements may be made to increase this metric?

C4. Does your program meet or exceed the regional and state medians **for increased student earnings and median change in earnings?**

_____YES _____No

If not, what program improvements may be made to increase this metric?
