Program Review – Annual Program/Discipline Update

Administrative Response and Follow Up

2020-2021

Program/Discipline: Physics

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Date: April 18, 2021

This section is for Administration to provide feedback.
To be prepared by Division Dean(s) and reviewed by DOI(s).

1. **Strengths and successes of the program as evidenced by the data, analysis and reflection:**

Introduction

The Physics SAC faculty are commended for jumping into the "pilot years" of PCC's new *Annual Program Update* process. 2020 and 2021 have been unusual years for many reasons and the Physics SAC successfully completed both the initial pilot and this year's revised pilot while the campus was closed and while courses were being taught remotely. Feedback from Physics SAC faculty will help the college to improve and to successfully move forward with the new *Annual Program Update* as it is scheduled to be implemented college-wide next year.
Thank you!

> *n.b.* The Physics SAC completed the *Annual Program Update* during PCC's pilot year 1 (second pilot group of 2020) and again in early 2021. Hence, the winter 2021 Physics SAC "B" documentation builds directly upon the recently finished 2020 A+B pilot. Similarly, this administrative response - being completed only a few months after the response to the Physics SAC's winter 2020 pilot - largely builds upon the administrative response from a few months ago.

Strength in qualifications and engagement

The Physics SAC includes exceptionally qualified and engaged faculty. This is evidenced by the following highlights: 1) substantial personal awards earned by faculty (e.g., NISOD Excellence in Teaching Award, League of Innovation Excellence Award, others); 2) long-term faculty-support for grant-funded activities including student research and curricular innovation (e.g., development of online physics support from a NASA grant); 3) long-term support for transformational out-of-class opportunities for students (e.g., EXITO-PSU transfer in physics, and the NASA Space Consortium scholarships, NASA SCORE grant, nationally recognized

student solar eclipse activities); 4) numerous publications in AAPT, the leading national publication for physics teachers, and presentations at physics education conferences.

Finally, the Physics SAC worked arduously to complete the rapid adaptation of laboratory courses for "temporary" remote instruction in spring 2020 and individual faculty have explored ways to extend lessons learned into "normal" on-campus courses when, eventually, we will return to in-person operations.

The division deans with physics encourage the Physics SAC members to build on this history of engagement and familiarize themselves with PCC's "How we get to YESS" webpage and opportunities to take action individually and as a SAC.

Strength in collaborations and partnerships

A number of individual physics faculty have supported our Oregon STEM Hubs, a key partner in Oregon's K12 STEM education work and in local (Portland and Beaverton) "Physics First" high school curriculum that has been designed to broaden participation and persistence in STEM education pathways.

In 2020, the PCC Physics SAC collaborated across campuses and also in the national work to share online laboratory resources during the start of the national COVID-19 pandemic when many courses transitioned to "temporary" remote delivery.

PCC faculty have supported curriculum across disciplines (e.g., physics and engineering curriculum, physics and geoscience-astronomy course materials)

The Physics SAC faculty are encouraged to build on its history of engagement and partnership by engaging with PCC Teaching and Learning Centers, which have recently reorganized in PCC's new one-college model. Please see suggested next steps (Sections 3 and 4, below) related to identifying best practices in STEM and opportunities to collaborate with other PCC SACs in STEM related YESS work.

2. **Areas of challenge or concern, if any:**

Challenges

Several action items were identified during completion of the 2020 and 2021 pilot *Annual Program Updates*. Specific recommended actions are listed in sections 3 and 4, below.

1) Pass rates in some courses.

The physics SAC has identified a critical concern: relatively low pass rates in a number of classes, especially the PHY 211 "calculus physics," which is a gateway course for STEM majors. It will be important to identify specific actions and specific resources that are needed for each action that is proposed to address the low pass rate. For example, the Physics SAC identified the possibility of *adding embedded tutoring* in the introductory physics courses. It is possible to quantify the resources that are required to establish a sustainable and college-wide process of direct support from math or math tutors. In addition, the Physics SAC identified the option to *provide pre-physics students with access to a math-preparatory software*; this is achievable if resources are quantified, and a timeline is established for a college-wide action, and if the college commits resources to this option. Something like ALEKS software, that the

college already uses in some courses, could help level the playing field for students of different backgrounds with different levels of preparation and it is reasonable to expect that this approach will advance equitable student success.

2) Student success rates among different populations.

The physics SAC has identified a second critical concern: although small sample size in some cases should cause us to monitor this over a longer period of time than a few years, the pass rates clearly differ in different populations. (eg., Higher pass rates are shown among women than among men, while the enrollment numbers are much lower for women than men.) It is possible that the combination of high success and low enrollment of women in PCC physics is explained by a single structural issue but is likely to be more complex. (i.e., In some studies, it has been shown that a man may register in engineering regardless of prior math success, but a woman may be "pre-filtered out" and only register if she has been highly math-successful in high school. This filter biases enrollment away from "math-average" women toward "math-average" men, explaining why the overall class shows higher male enrollment and lower male success rates. A similar structural filter has been shown to disproportionately increase withdrawal among math-average women.) *The SAC wrote that it is continuing efforts to recruit and retain female students, but it is not clear how these efforts have been made or if the physics faculty need additional resources to systematize these efforts college-wide, and to systematically track whether the efforts are yielding a positive impact.*

The Physics SAC has discussed in SAC meetings that students bring a variety of experiences, level of course preparation, personal life disruptions, work and family conflicts, etc. Since a range of student experience is expected, it is worthwhile to consider ways that PCC generally and the Physics SAC specifically could support students with the same range of experience. It is unlikely in the years ahead that variation in math skills, out-of-college life workload, etc. will decrease or become less complex. It is worth exploring strategies such as embedded tutoring, flexible early assignment deadlines, and other tested strategies that serve to level the playing field - to level differences in the environment that students experience before and during their time of attendance in a physics class.

3) College-wide class schedule of physics courses:

The SAC suggested that some schedule changes are likely to serve students well while minimizing the downside consequences of cancelled sections (ie., 102, 103). This is an important concern and it is one that is especially time sensitive given our current closure status due to COVID-19, and due to the physics faculty shortage at Cascade Campus that was identified long ago. While no college-wide class schedule is perfect for all students, this is an actionable item. College-wide scheduling will benefit from a college-wide discussion that specifically addresses the shifts that have been proposed by the SAC. More intentional college-wide scheduling started recently. The process is one that involves the four campus department chairs, the four division deans with physics, and it is likely to evolve as PCC shifts to

a one-college administrative structure. The details of this process will be made available to SAC members at an upcoming SAC meeting.

3. Reflection on goals and resources:

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Faculty hiring and FT/PT ratio

The Physics SAC has requested the addition of a full-time faculty member in physics at CA campus. This would help match full-time faculty to the size of the physics workload more evenly across the four PCC campuses. The division deans with physics support hiring a full-time faculty member at CA Campus. Potential new and vacant positions are being gathered on a college-wide list that will be examined in spring 2021. The division deans with physics support filling this position with a 1-year or 2-year temporary position in the event that the College chooses to spend the 2021-2022 year determining college-wide benchmarks and priorities for filling future full-time faculty positions.

Improve student success in PHY211

The Physics SAC has requested that a pre-test math assessment be created and provided to the students and that the Physics SAC be consulted regarding ways to remediate.

The deans appreciate the curiosity demonstrated by this request. The division deans with physics encourage the SAC to explore this and additional ways to support students with a range of preparation to reach the finish line together. It is likely that student preparation will continue to vary greatly in the years ahead, and strategies such as differentiated instruction are well recognized to increase success while also "leveling the playing field."

Authenticity of assessment methods

> "The SAC is aware of the resources offered by the office of Student Conduct and CARE...We believe there should be a college wide supported initiative to combat organized systematic cheating by way of "solutions sharing sites" rather than individual instructors working one-by-one to resolve integrity problems."

College-wide support to combat companies such as Chegg that ostensibly support student learning, but that are recognized by students and by PCC student services as a platform for sharing of exams, homework, etc. in a way that is inconsistent with the student responsibilities as outlined in the PCC's Student Rights and Responsibilities Handbook, and that invalidate the current homework and testing methods - at least as these are currently used by faculty - as accurate indicators of student learning. With the realization that there will be no single solution, the Physics SAC is encouraged to engage with faculty peers, with the TLC, and with our OL office to continue exploring assessment options that may look very different from those historically used to assess student learning. Assessments that are contextualized, especially if local and current, are less susceptible to Chegg or similar platforms and, in addition, these can engage students who may not easily identify as a "physics student" or a "STEM student."

4. Recommended next steps:

___ Proceed as planned on program review schedule

__X__ Follow up conversation needed with SAC, Dept Chair(s) and Dean

5. Additional comments/questions:

Topics for a follow-up conversation include:

1) Although deans and department chairs have implemented pre-scheduling sharing and are utilizing a college-wide process to plan course-by-course scheduling, the SAC made a number of specific changes for course scheduling. If these changes, suggested by the SAC, have not already been implemented, then the Physics SAC Chair and dean liaison (or the future Physical Sciences "Program Dean" in the new PCC organizational structure) can schedule a college-wide discussion to prioritize additional changes and set a timeline for implementation.

2) Work with the division deans (dean liaison, or the future Physical Sciences "Program Dean" in the new PCC organizational structure) and the PCC IE office to identify whether "week 1 withdrawal patterns" can be uncovered; while the data that the SAC requested isn't provided systematically, a few snapshots of certain courses may yield enough information to address the questions raised by the Physics SAC, and a snapshot or two may allow the physics SAC to act on this. Documenting if/when students withdraw during week 1 is technically possible now. Option 2: PCC is beginning deployment of new software, AdAstra. If snapshots aren't easy to ascertain now, then the dean liaison (or the future Physical Sciences "Program Dean" in the new PCC organizational structure) can explore use of AdAstra to pull the desired information in a format that is actionable by members of the Physics SAC.

3) The SAC asked whether PCC Physics enrollment trends match state and national trends. This is not information that is systematically provided to every SAC every year, but the SAC may be able to answer the question with a few snapshots of data. A reasonable next step is to search for sources of this data outside of PCC's IE office. It is recommended that this research be done in consultation with the Physics SAC dean liaison and the PCC Office of IE.

4) Improving Student enrollment and retention

It is recommended that the Physics SAC with support of the dean liaison consult with PCC recruiting staff, a team that is newly organized at the college, in order to explore strategies to increase enrollment of underrepresented groups in physics.

It is recommended that the Physics SAC consult with the PCC Student Success Centers and PCC's tutoring coordinators to explore proven strategies for increasing retention that include online tutoring and embedded tutoring.

Specifically, consult on issues related to 1) underrepresented groups, 2) pre-physics students and 3) in-class physics support. For example, there are ways to increase access to pre-physics prep resources and opportunities (ALEKS software, physics "prep" courses, etc.) And there are ways to increase access to tutoring while students are in a physics course. Faculty in some disciplines hold office hours in the Student Success Centers, for example. Finally, since recruitment and retention have been identified by the Physics SAC in prior program reviews, 5 and 10 years ago, it is recommended that the activities and resources that follow from the

consultations should be tracked. Since issues like recruitment and retention are unlikely to be resolved quickly, it will be easier to assess the impact of the input (faculty actions and college resources) if input actions and resources are documented at least twice per year, and reviewed as part of the new annual program update process. Documenting faculty actions and college resources may yield the additional benefit of showing a history of commitment and action and this could in turn open doors to additional resources including grant funds to support recruitment and retention.

The table below is intended to be a project start list. Timelines and initial consideration for participants and outcomes are suggested.

n.b. Some items in the table have been carried over from a few months ago (the second step of the 2020 ADU for Physics.)

Project	Initial Action and Participants	Timeline and next step
FT faculty hiring	Dean to add a CA faculty position to the district list for consideration. Please submit to your deans any additional justifications you might have to help bolster support for this position in 2021.	April 2021, for subsequent all-college consideration in spring-summer 2021.
Physics schedule changes (all-college)	Underway - deans, FDCs to discuss.	Underway and scheduled to occur every 3 months.
Week 1 Withdrawal Analysis	SAC representative, dean, Rep from IE to meet and define needs.	Summer 2021 so data can be shared at the fall SAC meeting.
External physics enrollment trends	SAC representative, dean, Rep from IE to meet and define specific interests and needs, including comparison of PCC enrollment trends with national trends.	Summer 2021 so data can be shared at the fall SAC meeting and used in 2021-2022 APU.
Adding embedded tutoring	SAC representative, dean, and representative of tutoring from Student Services. Explore existing models.	Summer or fall 2021, as soon as the college determines the college-wide manager of tutoring. SAC representative to report back to SAC at fall SAC meeting.
STEM best practices resources for	SAC representative, dean, TLC Coordinator, representative from OL, representative from Grants Office, to	Initial Spring meeting, with follow-up in fall 2021. If possible collaborate with

retention and completion	meet and define interests, existing resources, and priority new resources.	similar interests of Chemistry SAC.
Course materials inventory and descriptions	SAC Representative, dean, academic affairs to meet to determine mechanism for tracking a “course materials” inventory, scope of items to be included, and descriptors (eg., adoption status, cost to students, instructor- vs campus- vs college-wide adoption, and/or other details that impact accessibility and ability to adopt college-wide.)	June - September to generate an initial list that can be shared broadly at the fall SAC meeting for feedback.
Mini project to support graphical competency across all physics courses.	SAC Representative to meet with dean liaison to outline scope of this project (approximately 20 hours in special projects work.)	Spring 2021.