LDC Annual Discipline Update YEAR A: Fall 2019

SECTION 1: BASIC PROGRAM/DISCIPLINE INFORMATION

SAC Name: Physics

SAC Chair(s): Dr. Tony Zable (CA)

SAC Administrative Liaison: Dr. Dieterich Steinmetz (SY)

Other Division Dean(s): Laura Horani (SE, interim), Matthew Altman (RC), Dr. Alyson Lighthart (CA)

Department Chair(s): Dr. Tony Zable (CA), Dr. Vicki Schroeder (RC), Rod Lee (SYL), Lee Collins (de facto @ SE)

Classes/Services offered at: **CA RC SE SY** NB HC WCC Metro CLIMB Other______

1A. Program Staffing – This section is the responsibility of and should be facilitated by the SAC Administrative Liaison based on the particular cleverness of fellow Deans, FDCs, and trusty admins.
Please indicate the number of each type of staff in your discipline college-wide.
For the prior academic year: Summer 2018 - Spring 2019

For # of FT faculty – Use the campus where the instructor's primary assignment/contract is based.

- Run NWRPINC district report for FT faculty only
- Sort by position description (which puts the list in subject area order)
- Sort by ORG code to get campuses.
  *Note: this is a headcount. Do not consider release time in this column.

IFTE is Instructional Work done by FT and PT faculty

- Run SWRFFTE, and at the bottom of the report you will see an IFTE Total for FT, Overload, AJ.
- This report needs to be run for each of the four terms in the year (starting summer) and then summed.
- Be sure to use regular instructional workload; enter FT, OL, and AJ in the 4th, 5th, and 6th columns.
- Releases will show up as a separate total on the report; enter release in the 3rd column.

Table 1A: Employees and IFTE Summer 2018 - Spring 2019, Physics

Cost Center:	**# of FT Fac**	**FT Fac IFTE** 4 term total	**Overload IFTE** 4 term total	**PT (AJ) Fac IFTE** 4 term total	**Release FTE** (any reason)	**Other Employees** (tech staff , IAAs casual, please identify roles)
Sylvania (1)	3	0.000 2.630 2.526 + 1.898 **7.054**	0.732 0.204 0.000 + 0.366 **1.032**	2.724 3.090 4.470 + 4.826 **15.110**	0.000 0.000 0.500 + 0.750 **1.250**	IST (10% FTE) IAA2 (20% FTE) No casuals
Cascade (2)	1	0.000 0.706 0.706 + 0.706 **2.118**	0.894 0.162 0.162 + 0.162 **1.380**	2.264 2.562 1.830 + 1.830 **8.486**	0.000 0.375 0.375 + 0.375 **1.125**	IST (33% FTE) (also covers CH & G/GS) IAA (0% FTE) [not an error per A.L.*] No casuals solely assigned to PHY
Rock Creek (3)	2	0.000 1.370 1.736 + 1.736 **4.842**	0.732 0.000 0.000 + 0.000 **0.732**	0.366 1.396 1.830 + 1.830 **5.422**	0.000 0.375 0.375 + 0.375 **1.125**	IST (50% FTE by subject or 28% by enroll FTE) IAA (20% FTE by subject or 18% by enroll FTE) No casuals solely assigned to PHY
Southeast (4)	1	0.000 1.030 0.962 + 0.962 **2.954**	0.366 0.000 0.000 + 0.000 **0.366**	0.366 0.324 0.732 + 0.732 **2.154**	0.000 0.000 0.000 + 0.000 **0.000**	IST (5% FTE) IAA (5% FTE) No casuals
Other (centers, shared, etc.)						
District Totals	7	7.054 2.118 4.842 + 2.954 **16.968**	1.032 1.380 0.732 + 0.366 **3.510**	15.110 8.486 5.422 + 2.154 **31.172**	1.250 1.125 1.125 + 0.000 **3.500**	IST: about 98% FTE IAA: about 45% FTE

Notes about faculty teaching on multiple campuses or disciplines, or locations different from cost center indicated:

Questions/Notes about non-faculty support staff:

1. In Table 1, how are the IST & IAA FTE #'s calculated? *The Physics SAC requests that the data be standardized by using the same equation/criteria.*

SECTION 2: REFLECTING ON DATA

2A. Enrollment

Enrollments (SFTE) per year; Location (where course is taught); Modality
SEE APPENDIX A DATA TABLES 2A (1- 4)

2A1. What conclusions or observations are suggested by this data?

Physics enrollment has declined at a slightly more rapid pace than overall collegewide enrollment. Overall, PCC enrollment in Lower Division Transfer courses has dropped 3% from 2016-17 to 2018-19. Physics enrollment has dropped by 10.3% in the same time period. However, there are several sub-trends within this data that shows that some sequences' enrollments are changing more rapidly than others.

The most obvious observation from this data is the low and declining enrollment of PHY102 and 103. These two courses are designed as laboratory science courses for non-science majors. PHY102 and 103 have always been lower enrolled than PHY101, likely because many students and advisors incorrectly perceive PHY101 as being a prerequisite for 102 and 103, which it is not. The Physics SAC has made several attempts to correct this misconception by directly contacting academic advisors and changing the course names to better reflect the content covered. In total, PHY102 and 103 SFTE has decreased from 5.7 in 2016-17 to 4.0 in 2018-19, which represents a 30% decrease.

PHY201/202/203 enrollment has decreased by 19% over the last 3 years. Most of this decrease has come from Sylvania and Southeast campuses. Cascade campus did not lose any enrollment in PHY201/202/203 during this time period.

Among courses taught in person, PHY211/212/213 has decreased the least over the last three years, and enrollment actually increased from 2016-17 to 2017-18. Overall the PHY211/212/213 sequence decreased from 178.8 SFTE in 2016-17 to 164.3 SFTE in 2018-19, an 8% decrease.

Note: Online courses in astronomy (PHY121/122/123) have increased enrollment by 10% over the last 3 years.

2A2. Do the data suggest adjustments in your discipline with regards to enrollment? If yes, what ideas/strategies do you have that you would like to implement or have help with?

Although it's difficult to extrapolate trends from data sets with such small numbers, it is reasonable to assume that PHY102 and PHY103 enrollment will likely not increase until collegewide enrollment increases. Therefore, resources spent offering PHY102 and 103 could be spent adding more sections of PHY101 and 121, which are more likely to fill.

2A3. Are there other data reports that you would find informative/useful with regards to enrollment? How would this information support decision-making for the program?

1. Trends in enrollment are difficult to put into context without a basis of comparison, therefore we suggest several additional reports be added to this:
    - Total SFTE per campus
    - Total SFTE Collegewide
    - Total Physics SFTE for all colleges in Oregon
    - Total Physics SFTE for all colleges nationwide, or a representative sample of large, 4 year colleges nationwide
2. We would also like some clarification on the data included in this report, including:
    - Please explain in the data the calculation sFTE
    - Please provide in the data specifically when during the term/year the sFTE & enrollment numbers are generated

Finally, we feel it would be useful to see the trends in enrollment during the term to determine how many students are dropping courses in the first several weeks. *Generating two separate reports, one on day 1 and the other at the end of week 2, would give a clear picture of how many students we lose at the start of the term.* If this is significant, we could look for ways to retain these students before they drop their course.

2B. Course Success Rates
% A, B, C or P divided by total count of grades A-F, P, NP W and I; all courses in the subject area

% Passing By Course and Modality
SEE APPENDIX A, DATA TABLE 2B-1

2B1. Are there any courses and/or modalities with consistently lower or higher pass rates than others?

Physics 211 has a consistently lower than average pass rate (2016-2017: 72.0%, 2017-2018: 71.3%, and 2018-2019: 68.4%). This course is the first General Physics class with calculus and is taken by students majoring in engineering, computer science, physical and biological sciences, and others desiring to enter STEM fields.

Other courses with noticeably low pass rates include Physics 101, 121, 123, and 201. Physics 101, 121, and 123 are taken by a large number of students to fulfill General Education requirements. Physics 201 is taken primarily by students majoring in biology, chemistry, allied-health sciences, medical fields, and other majors not requiring calculus-based physics.

2B2. Are there any actions to be taken to understand/address lower success rates?

Many students who take Physics 211 are unprepared for the rigor of the course, have insufficient math and science skills, and have not made the time commitment to succeed. Faculty have noted that up to one-third of all students who enroll in Physics 211 end up withdrawing or failing the course. Poor algebra, trigonometry, calculus, and critical thinking skills have been observed by faculty as well. Some of the solutions the Physics SAC is currently in the early stages of identifying an effective strategy(s) that can be implemented to address the lower student success rates in Phy211. There has been preliminary discussion regarding the inclusion of embedded tutoring in the intro physics courses, as well as establishing a means for direct support from math or math tutors. In addition, providing pre-physics students with access to a math-preparatory software, something like Aleks, would be a beneficial resource to help students catch up. Another more drastic measure might be to develop a physics preparatory course (similar to the chemistry preparatory course, Chemistry 151) which might assist these students gain a better foundation in specific science and math skills before attempting Physics 211.

2B3. In courses with relatively high success rates, are there some distinguishing characteristics that might account for those results? What can be learned that might be applied to courses with lower success rates?

Courses with noticeably high pass rates include PHY 103, 202, 203, and 212. Physics 103 is a General Education class but may have a high pass rate as it's the third course in conceptual physics. Physics 202 and 203 (the second and third courses in the General Physics (without calculus) sequence) are taken by students who have successfully completed Physics 201.

Enrollment and % Passing By Course and Student Demographics

SEE APPENDIX A, DATA TABLES 2B-2, 2B-3 (a-c) AND 2B-4

2B4. Do the data suggest adjustments related to student success for different student populations? If yes, what adjustments will you make?

There are discrepancies in pass rates for individual physics courses among male, female, and unknown genders. There isn't sufficient data to draw any conclusions with regard to non-binary gender student success. Here we look at the first course in each of the three sequences. Over a three year period (2016-2019), Physics 211 pass rates are 74.4% for females (285 females enrolled) and 69.2% for males (1224 males enrolled). Physics 201 pass rates are 76.8% for females (701 females enrolled) and 73.5% for males (768 males enrolled). Physics 101 pass rates are 80.6% for females (377 females enrolled) and 75.8% for males (816 males enrolled). It is worth noting that despite a much larger male enrollment in all three of these courses (e.g. in Physics 211, males make up 81.1% of the enrollment while females make up 18.9% of the enrollment), the success rate is noticeably higher among females. We are continuing efforts to recruit and retain female physics students by working with advisors and students directly.

There are discrepancies in pass rates for individual courses among various ethnicities. Over a three year period (2016-2019), Physics 211 pass rates are as follows: American Indian (66.7%), Asian (68.9%), Black or African American (68.0%), Hispanic (67.9%), Hawaiin Pacific Islander (no data), International (76.6%), White

(71.7%), two or more ethnicities (73.3%), Unknown (71.4%). Physics 201 pass rates are as follows: American Indian (insufficient data), Asian (81.9%), Black or African American (55.5%), Hispanic (68.3%), Hawaiin Pacific Islander (71.4% with one year missing), International (85.6%), White (76.8%), two or more ethnicities (69.8%), Unknown (73.7%). Physics 101 pass rates are as follows: American Indian (no data), Asian (77.2%), Black or African American (74.0%), Hispanic (72.1%), Hawaiin Pacific Islander (100% with two years missing), International (82.3%), White (78.3%), two or more ethnicities (70.4%), Unknown (85.4%). Some of these groups (American Indian, Hawaiin Pacific Islander, International) had very low representation in these calculations, and, therefore, may not accurately reflect passing rates. Asian, International, and White groups have the highest pass rates. Black and Hispanic groups have the lowest pass rates.

2B5. Are there any other data reports you would find useful to have related to student success. How would this data inform decisions relating to teaching and learning?

1. Please provide in the data specifically for when the enrolled students were tabulated. Were total enrolled students based on 1st day of class, end of 1st week, end of 2nd week, end of 8th week, end of term, etc.? *At a minimum, the Physics SAC would like to observe the attrition rates prior to the end of term for a more accurate assessment of success rates and would prefer to see the student enrollment data for end of 2nd week and end of term.*

SECTION 3: REFLECTION ON ASSESSMENT OF STUDENT LEARNING

3A. Assessment Reports:
(*To be completed by Academic Affairs, with space for notes from program if needed)*

_X_ Current Multi Year Plan (MYP) submitted and current
_X_ 2018- 2019 Plan and EOY submitted

Notes from Academic Affairs:
All LDC MYPs are officially "out of date" for this year, but since we are in the middle of changing expectations, we did not ask for new MYPs this Fall. This is expected to need to be changed next year to reflect new assessment options.

3B. Please respond to the question below, which relates to your SACs 2019-20 Learning Assessment Report to the Learning Assessment Council (LAC).

Context Statement
The Physics SAC planned to assess students' quantitative literacy through graphical analysis at the beginning of PHY 101 and PHY 211 via a pre-test and at the end of these courses via a post-test. They identified two assessment administration issues that compromised the validity and reliability of the data, but that the student's overall ability to demonstrate attainment of the outcome was less than had been hoped. They did indicate that the assessment would be attemened again in Fall 2019, with methodological improvements intended to more accurately assess students abilities.

Peer Reviewers' Comments and Question
The SAC is to be commended for being vulnerable in analyzing what really happened with the project. This is how we learn as instructors and how we help our students… Moving forward, your proposed plan seems very reasonable and sound.

The reviewers suggest that…some points [be] attached to these assignments (i.e. making them embedded assignments) to facilitate instructors remembering to give the assignment and students to have more incentive to provide more input.

Question: *Is the SAC moving forward with the plan to assess again this year? If so, what changes will be made in the administration of the assessment to improve the usefulness of the results? (If not, what alternative assessment is planned?). Has the SAC discussed increasing emphasis on graphical analysis in these courses to help students master essential graphing skills? If so, what is the plan for doing so? (If not, please comment on the rationale).*

- The SAC moved forward with its assessment plan for 2019-2020.
- The implementation of the assessment last Winter (2019) yielded problems due to the timing of our administration of the pre-assessments and post-assessments. This year, we made a few regulatory statements about the manner and timing of administering the assessments. These regulations include needing to be consistent with the environment in which pre- and post-assessments were given (near graded tests, duration of assessments, near beginning or end of class, during labs, etc.). We also regulated what students would be supplied during the assessments: a scientific calculator and a straight-edge. These regulations improved the usefulness of the results greatly, as the data tended more toward what was to be expected: an increase of score from the pre-assessment to the post-assessment.
- The SAC has identified graphical competency, as well as interpretation of quantitative data, as a significant core outcome of PCC Physics courses.
    - Some faculty have already begun to improve on course material specific to graphical competency.
    - It was further discussed that PHY101 courses lacked graphical analysis after kinematics. To fix the issue, we believe we can include graphical analysis in our discussion about conservation of energy, which is customarily taught toward the later half of the term. This would ensure that students get exposed to skills relating to graphing and interpreting graphs throughout the term more evenly.
    - Districtwide strategies will be developed when we meet for the Spring SAC In-Service, based on the final outcome of this year's assessment.

SECTION 4: ADDITIONAL COMMENTS / CONTEXT / ACHIEVEMENTS / CHALLENGES

4. Is there anything you would like to share about your discipline at this time? (e.g. notable achievements, challenges, issues, broad goals, additional context)? (Please limit response to 300 words)

We believe that the PCC Physics Department is the best community college physics department in the United States, and here is why:

Awards

- Lee Collins, received League for Innovation Excellence Award 2017

- Toby Dittrich, PCC Excellence in Teaching Award, (NISOD), 2020.

Publications

Over the past five years, PCC Physics Faculty as a collective have published 20 scholarly articles in peer-reviewed journals and patents. It was recently brought to the SAC's attention that PCC faculty have in fact published more articles in The Physics Teacher and the American Journal of Physics combined than any other physics department in any university or college in the world! In addition, an article authored by Minkin and Sikes (in bold) has been identified as "the most read article in AmJ for the past two years". An article by Dittrich (in bold) was in the top ten read articles in 2015.

1. L. Minkin, D. Sikes. *Yo -yo jerk dynamics in the vicinity of the lowest point.* The Physics Teacher (accepted for publication).
2. R. Drosd, L. Minkin. *Measuring the coefficient of kinetic friction by exploring dynamics of rotational motion*. The Physics Teacher, vol. 58 (3), 176-178 (2020).
3. L. Minkin, P. Whiting. *Restricted Brachistochrone.* The Physics Teacher, vol. 57, 359-361 (2019)
4. L Minkin, P. Whiting. *Road capacity with a steady flow traffic.* Physics Education, 53, #5 (2018)
5. L. Minkin, P. Whiting. *Comment on "Approaching the brachistochrone using inclined planes—striving for shortest or equal travelling times"* . Physics Education, vol. 53, #5 (2018)
6. L. Minkin, D. Sikes. *Explanation of Loop the Loop Demonstration with Rolling Radius Correction.* Indian Journal of Physics Education, vol. 34, 1-4, (2018) http://www.physedu.in/uploads/publication/32/456/2.-456-Loop-to-Loop-.pdf
7. L. Minkin, A.S. Shapovalov. *The Electromagnetic Force Between Two Moving Charges.* Physics Education, vol 53, #3, 1-5 (2018), http://iopscience.iop.org/article/10.1088/1361-6552/aaab88/meta
8. **L. Minkin, D. Sikes. *Coefficient of Rolling Friction – Lab Experiment.* American Journal of Physics, vol. 88, #1 (2018), http://aapt.scitation.org/doi/full/10.1119/1.5011957**
9. L. Minkin, D. Sikes. *Measuring the coefficients of kinetic and rolling friction by exploring decay mass-spring oscillations.* Physics Education, vol. 53, #1, 1-6 (2018)
10. http://iopscience.iop.org/article/10.1088/1361-6552/aa8a55/meta
11. W. Dittrich, R. Drosd, L. Minkin, A.S. Shapovalov. *The Law of Entropy Increase - Lab Experiment*. The Physics Teacher. vol. 54, 348 (2016)
12. L. Minkin, A.S. Shapovalov. *Thermo-Diffusional Radon Waves in Soils*. Science of the Total Environment. vol. 565, 1-7, (2016). http://www.sciencedirect.com/science/article/pii/S004896971630824
13. L. Minkin, A.S. Shapovalov. *Vector Addition in Physics*. Physics Education, v. 31, 1-7 (2015). http://www.physedu.in//uploads/publication/19/222/7-VectorAddition-in-Physics.pdf
14. **Drop Tower Physics, William A. (Toby) Dittrich, *The Physics Teacher* Vol. 52, 2014 page 377**
15. Drop Tower Physics II, William A. (Toby) Dittrich, *The Physics Teacher* submitted 2018
16. Jerk on the Loop the Loop, W. Dittrich and K. Mamola, *American Journal of Physics*, submitted 2020
17. Hair Ice: An Interdisciplinary Science, W. A. (Toby) Dittrich, *The Physics Teacher*, under peer review 2020.
18. Introducing Voice Recognition into Education, William A. (Toby) Dittrich and Sequoia Star, *Proceedings of the 5th International Conference on Advances in Higher Education*, HEAD 18, Valencia Spain June 2018.
19. Five US and Canadian Patents, Toby Dittrich, on using Voice Recognition in Education, licensed to Northwest Educational Software, Inc.
20. Drop Tower Physics YouTube Channel, Please take a look ! Teachers around the world are using this classroom tool. https://www.youtube.com/playlist?list=PLRfHZ9wXKs6eiIsULzz-lx20a3Ryq0sHk

Grants

- The Oregon NASA Space Grant funded a two year temporary full-time faculty member in physics and astronomy to develop Physics 121 (The Solar System), 122 (Stars and Galaxies), and 123 (Cosmology) online. The grant required that the courses use open educational resources and meet national accessibility standards. (2015-2016) The online labs were shared nationally via an invited talk at the AAPT Winter 2019 Meeting in Houston, Texas. The talk entitled "Successful Online Astronomy

Labs" was given by Rod Lee. Additionally, these same labs have been shared nationally via Toby Dittrich through AAPT's Two-Year College Committee.

- A PCC physics student was awarded a NASA SCORE grant for modeling traffic flow with fluid mechanics (2018).
- Numerous physics students from PCC have received NASA Space Consortium scholarships and/or internships
- District-wide, several physics faculty have participated as mentors for the PCC EXITO Scholars Program, 2016-present

National Committee Involvement

- Toby Dittrich, Member American Association of Physics Teachers, Subcommittee on Astronomy and Space Science, 2015 -2018.
- Toby Dittrich, Member American Association of Physics Teachers, Committee on Undergraduate Physics Education, 2018- present.

Invited Speaker Sessions in National and International Conventions:

- Toby Dittrich, Invited Talks:
  - Modern Eddington Experiment, PNACP Spring Meeting 2016
  - Modern Eddington Experiment, AAPT Summer Meeting, Sacramento 2016
  - Modern Eddington Experiment, AAPT Winter Meeting, New Orleans, 2016
  - Modern Eddington Experiment, AAPT Winter Meeting, Atlanta, 2017
  - Introducing Voice Recognition into Education, Fifth Annual Conference on Advances in Higher Education, University of Valencia, Valencia, Spain, June 2018
  - Modern Eddington Experiment_ Results, AAPT Summer Meeting, San Diego, July 2018
  - Drop Tower Physics, AAPT Spring Oregon Meeting, Mt. Hood CC, February 2019
  - Space Science in the Undergraduate Classroom, AAPT Winter Meeting, Houston, 2019
  - Drop Tower Physics, NW APS Spring Meeting, Bellingham WA, April 2019
  - Should Angular Displacement be a Vector Quantity, AAPT Winter Meeting Orlando, Jan 2020.

Student Research Support

The Physics Faculty were actively involved in a number of research projects in the past 5 years. Many of these projects culminated in peer-reviewed publications. The following are highlights:

- During the 2017 Total Solar Eclipse, with financial support from the Oregon NASA Space Grant and Portland Community College, Toby Dittrich and four students worked with famed amateur astronomer Richard Berry to measure the deflection of starlight around the eclipsed sun. This recreation of the historic Eddington Experiment of 1919, an experiment that verified Einstein's Theory of General Relativity and made Einstein instantly world famous. Since then seven attempts have been made and in 2017 twelve parties attempted the experiment. Two parties were successful - our students at PCC and one other. PCC physics students became the first students in history to measure the curvature of space. Another larger attempt is being planned with 10-15 other colleges in Mexico in 2024.

- In 2017 two students with the guidance of Toby Dittrich, using equipment from Vernier Software in Beaverton and funded by an Oregon NASA Space Grant SCORE grant, modified Vernier's electronic distance,speed and acceleration meter to adapt it for free fall. They successfully measured the acceleration due to gravity with it.

- In 2018 with Toby Dittrich continuing his climate change research, two students developed a new way to instantly measure the energy flow rate into a glacier on Mt. Hood, also instantly measuring the ice melt rate. This method using a medium sized cryoconite (rock on ice) was invented by Toby Dittrich and came into use worldwide as an easy, fast and cheap way to measure these parameters.

- In 2018, under the guidance of Darrell Lim and with NASA SCORE grant funding, a student modelled traffic flow with fluid mechanics.

Conferences

Several physics faculty have attended national conferences and workshops:

- National AAPT Winter Meeting, 2015, 2016, 2017, 2019, 2020
- Mastering Physics Leadership Conference, 2017
- AAPT Spring Meeting, 2019 (Vicki & Laura)
- Vernier Active Learning Workshop, 2018 (Rod) and 2019 (Darrell)
- Toby Dittrich, Every national AAPT Meeting since 2015, ten in total. Hosting the 2021 meeting at PCC Sylvania Campus - the first time a community college has hosted a national meeting.
- SE: Vernier Active Learning Workshop, 2016 (Lee)
- League for Innovations Conference, 2017 (Lee)
- Quality Matters Conference Presentation "Making Astronomy Classes Accessible to Visually Impaired Students", 2016 (Rod)
- Pacific Northwest Great Teacher Seminar, 2018 (Darrell)

SECTION 5 IS IN PART B, YEAR 2

****

SECTION 6: ADMINISTRATIVE FEEDBACK AND FOLLOW UP
This section is for Administration to provide feedback.
To be prepared by Division Dean(s) and reviewed by DOI(s)

6A. Strengths and successes of the discipline as evidenced by the data, analysis and reflection:

See feedback for Part A and for Part B at the end of Part B Section 6.

6B. Areas of concern, if any:

6C. Recommended Next Steps:

___ Proceed as planned on discipline review schedule

___ Further review / Out-of-Cycle in-depth review

6D. Additional Comments:

LDC Annual Discipline Update YEAR B: Fall 2019

SECTION 1: BASIC PROGRAM/DISCIPLINE INFORMATION

SAC Name: Physics

SAC Chair(s): Dr. Tony Zable (CA)

SAC Administrative Liaison: Dr. Dieterich Steinmetz (SY)

Other Division Dean(s): Laura Horani (SE, interim), Matthew Altman (RC), Dr. Alyson Lighthart (CA)

Department Chair(s): Dr. Tony Zable (CA), Dr. Vicki Schroeder (RC), Rod Lee (SYL), Lee Collins (de facto @ SE)

Classes/Services offered at: **CA** **RC** **SE** **SY** **NB** HC WCC Metro CLIMB Other______

1A. Program Staffing – This section is the responsibility of and should be facilitated by the SAC Administrative Liaison based on the particular cleverness of fellow Deans, FDCs, and trusty admins.
Please indicate the number of each type of staff in your discipline college wide.
For prior academic year: Summer 2018 - Spring 2019

For # of FT faculty – Use the campus where the instructor's primary assignment/contract is based.

- Run NWRPINC district report for FT faculty only
- Sort by position description (which puts the list in subject area order)
- Sort by ORG code to get campuses.
  *Note: this is a headcount. Do not consider release time in this column.

IFTE is Instructional Work done by FT and PT faculty

- Run SWRFFTE, and at the bottom of the report you will see an IFTE Total for FT, Overload, AJ.
- This report needs to be run for each of the four terms in the year (starting summer) and then summed.
- Be sure to use regular instructional workload; enter FT, OL, and AJ in the 4th, 5th, and 6th columns.
- Releases will show up as a separate total on the report; enter release in the 3rd column.

Table 1B. ***(repeated from Year A)***

Cost Center:	**# of FT Fac**	**FT Fac IFTE** 4 term total	**Overload IFTE** 4 term total	**PT (AJ) Fac IFTE** 4 term total	**Release FTE** (any reason)	**Other Employees** (tech staff , IAAs casual, please identify roles)
Sylvania (1)	3	0.000 2.630 2.526 + 1.898 **7.054**	0.732 0.204 0.000 + 0.366 **1.032**	2.724 3.090 4.470 + 4.826 **15.110**	0.000 0.000 0.250 + 0.500 **0.750**	IST (20% FTE) IAA2 (20% FTE) No casuals
Cascade (2)	1	0.000 0.706 0.706 + 0.706 **2.118**	0.894 0.162 0.162 + 0.162 **1.380**	2.264 2.562 1.830 + 1.830 **8.486**	0.000 0.375 0.375 + 0.375 **1.125**	IST (33% FTE): (also covers CH & G/GS) IAA (0% FTE) [not an error per A.L.] No casuals solely assigned to PHY
Rock Creek (3)	2	0.000 1.370 1.736 + 1.736 **4.842**	0.732 0.000 0.000 + 0.000 **0.732**	0.366 1.396 1.830 + 1.830 **5.422**	0.000 0.375 0.375 + 0.375 **1.125**	IST (1 FTE by subject or 28% by enroll FTE) IAA (20% FTE by subject or 18% by enroll FTE) No casuals solely assigned to PHY
Southeast (4)	1	0.000 1.030 0.962 + 0.962 **2.954**	0.366 0.000 0.000 + 0.000 **0.366**	0.366 0.324 0.732 + 0.732 **2.154**	0.000 0.000 0.000 + 0.000 **0.000**	IST (2% FTE) IAA (5% FTE) No casuals
Other (centers, shared, etc.)						
District Totals	7	7.054 2.118 4.842 + 2.954 **16.968**	1.032 1.380 0.732 + 0.366 **3.510**	15.110 8.486 5.422 + 2.154 **31.172**	0.750 1.125 1.125 + 0.000 **3.000**	IST: About 90% FTE IAA: About 45% FTE

Notes about faculty teaching on multiple campuses or disciplines, or locations different from cost center indicated:

Notes about non-faculty support staff:

1. In Table 1, how are the IST & IAA FTE #'s calculated? *The Physics SAC requests that the data be standardized by using the same equation/criteria.*

SECTION 2 IS IN PART A, YEAR 1

SECTION 3: REFLECTION ON ASSESSMENT OF STUDENT LEARNING

3A. Assessment Reports:
(*To be completed by Academic Affairs, with space for notes from program if needed)*

_X_ Current Multi Year Plan (MYP) submitted and current
_X_ 2018- 2019 Plan and EOY submitted

Notes from Academic Affairs:
All LDC MYPs are officially "out of date" for this year, but since we are in the middle of changing expectations, we did not ask for new MYPs this Fall. This is expected to need to be changed next year to reflect new assessment options.

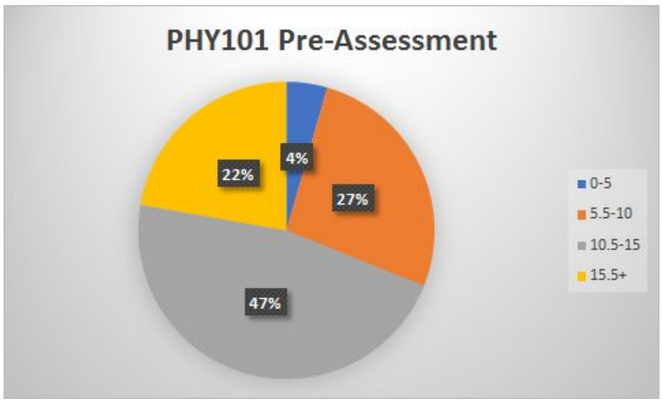
3B. Please respond to the question below, which relates to your SACs 2019-20 Learning Assessment Report to the Learning Assessment Council (LAC).

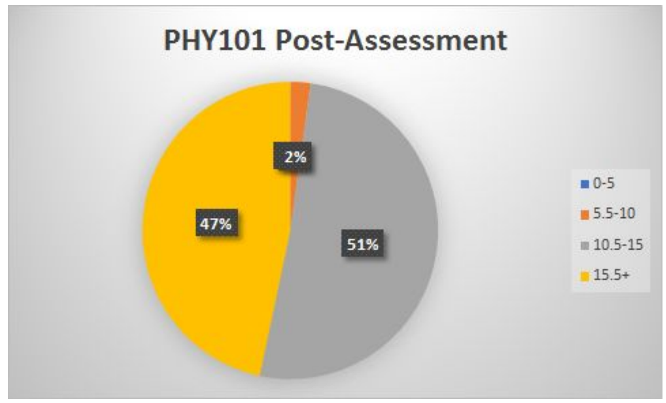
Context Statement
The Physics SAC planned to assess students' quantitative literacy through graphical analysis at the beginning of PHY 101 and PHY 211 via a pre-test and at the end of these courses via a post-test. They identified two assessment administration issues that compromised the validity and reliability of the data, but that the student's overall ability to demonstrate attainment of the outcome was less than had been hoped. They did indicate that the assessment would be attemened again in Fall 2019, with methodological improvements intended to more accurately assess students abilities.

Peer Reviewers' Comments and Question
The SAC is to be commended for being vulnerable in analyzing what really happened with the project. This is how we learn as instructors and how we help our students… Moving forward, your proposed plan seems very reasonable and sound.
The reviewers suggest that…some points [be] attached to these assignments (i.e. making them embedded assignments) to facilitate instructors remembering to give the assignment and students to have more incentive to provide more input.

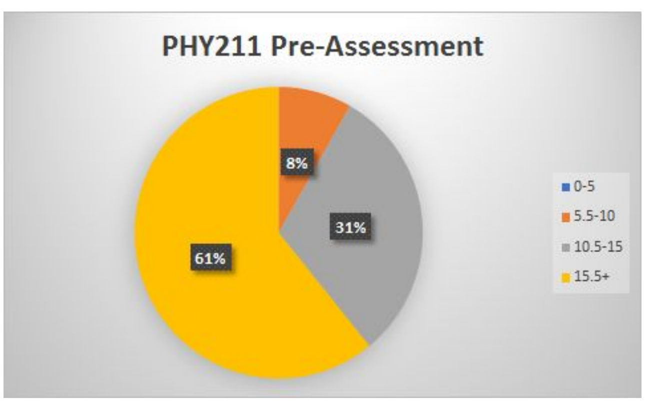
Question: *Is the SAC moving forward with the plan to assess again this year? If so, what changes will be made in the administration of the assessment to improve the usefulness of the results? (If not, what alternative assessment is planned?). Has the SAC discussed increasing emphasis on graphical analysis in these courses to help students master essential graphing skills? If so, what is the plan for doing so? (If not, please comment on the rationale).*

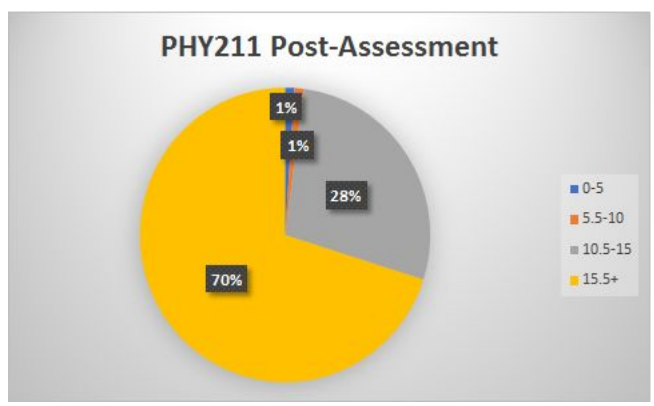
- Results from the 2019-2020 Assessment of Student Graphical Competency:
    - The Physics 101 sample size was substantially smaller than that of Phy211. The data will have to be taken with that caveat in mind. A significant increase in passing scores (70% or higher) was seen in the PHY101 post-assessment compared to their pre-assessment, with a total score increase of about 23%. A large majority of students in PHY101 who took the assessments improved their score during the course of the term: 26% lowered their score, 5% stayed the same, and 69% highered their score. The average percentage increase in score is 50%. Below is a pie chart of the percentage of PHY101 students who scored certain points out of 20.





    - The Physics 211 sample size was larger with 97 total participants. Different from Physics 101, there was not a significant increase in passing scores (70% or higher) between the pre-assessment and the post-assessment. The number of participants with passing scores increased from 74% to 85%. The total score increase was around 5%, compared to the 23% for Physics 101. That being said, the percentage of Physics 211 participants that showed improvement in their post-assessment score was a bit lower: 38% lowered their score, 6% stayed the same, and 56% highered their score. The average percentage increase in score is 9%. Below is a pie chart of the percentage of PHY211 students who scored certain points out of 20.





    - **Analysis:** Since Physics 211 students come in more well-prepared with skills relating to graphing and interpreting graphs, their improvements are expected to be less drastic than Physics 101 students. 74% of Physics 211 students already passed the 70% threshold in their pre-assessment, while only a mere 33% of Physics 101 students passed in their pre-assessment. An additional metric to analyze effectiveness would be to take the ratio of (# of improved assessment scores) to (# of degraded scores). This is a fairly simple mathematical procedure. However, it would be problematic given that this metric wouldn't account for the magnitude of improvement. For instance, some students may greatly improve their assessment scores while a larger number of students may only slightly go down in score. This may naively show an ineffectiveness without looking at the whole picture. Another metric to analyze effectiveness could be to take the average percentage increase in score of all participants.[1] Using this metric, Physics 101 courses seem to be greatly more effective in teaching graphical analysis. The issue with this metric is it doesn't account for students who might have an already high pre-assessment score, where there is little to improve upon. This would naively suggest that a course which teaches something that students already know (whether it teaches it well or not) is ineffective, whereas it may have been effective in teaching about graphical analysis to those who haven't had prior training.

- **Future Analysis:** A more stream-lined version of the graphical analysis assessment has been developed where the use of google quizzes automatically grades student answers and exports them into excel for further analysis. An excel template has also been developed to receive exported data and organize them based on matching G#. This way, we can analyze the progress of each individual student by the matching G#. This new stream-lined version of the graphical analysis assessment will be discussed in the next SAC meeting and will likely be implemented in the next iteration of testing.

[1] $Average\,\% = \frac{\Sigma(\Delta\%_i)}{N}$, *where* $\Delta\%_i$ *is the % increase from pre- to post-assessment for the i-th student and N is the total # of students assessed.*

SECTION 4: ADDITIONAL COMMENTS / CONTEXT / ACHIEVEMENTS / CHALLENGES

4. Is there anything you would like to share about your discipline at this time? (e.g. notable achievements, challenges, issues, broad goals, additional context)? (Please limit response to 300 words)

(repeated from Year A)
We believe that the PCC Physics Department is the best community college physics department in the United States, and here is why:

Research

The Physics Faculty were actively involved in a number of research projects in the past 5 years. Many of these projects culminated in peer-reviewed publications. The following are a couple highlights:

- During the 2017 Total Solar Eclipse, with financial support from the Oregon NASA Space Grant and Portland Community College, Toby Dittrich and four students worked with famed amateur astronomer Richard Berry to measure the deflection of starlight around the eclipsed sun. This recreation of the historic Eddington Experiment of 1919, an experiment that verified Einstein's Theory of General Relativity and made Einstein instantly world famous. Since then seven attempts have been made and in 2017 twelve parties attempted the experiment. Two parties were successful - our students at PCC and one other. PCC physics students became the first students in history to measure the curvature of space. Another larger attempt is being planned with 10-15 other colleges in Mexico in 2024.

- In 2017 two students with the guidance of Toby Dittrich, using equipment from Vernier Software in Beaverton and funded by an Oregon NASA Space Grant SCORE grant, modified Vernier's electronic distance,speed and acceleration meter to adapt it for free fall. They successfully measured the acceleration due to gravity with it.

- In 2018 with Toby Dittrich continuing his climate change research, two students developed a new way to instantly measure the energy flow rate into a glacier on Mt. Hood, also instantly measuring the ice melt rate. This method using a medium sized cryoconite (rock on ice) was invented by Toby Dittrich and came into use worldwide as an easy, fast and cheap way to measure these parameters.
- In 2018, under the guidance of Darrell Lim and with NASA SCORE grant funding, a student modelled traffic flow with fluid mechanics.

Publications

Over the past five years, PCC Physics Faculty as a collective have published 20 scholarly articles in peer-reviewed journals and patents. It was recently brought to the SAC's attention that PCC faculty have in fact published more articles in The Physics Teacher and the American Journal of Physics combined than any other physics department in any university or college in the world! In addition, an article authored by Minkin and Sikes (in bold) has been identified as "the most read article in AmJ for the past two years". An article by Dittrich (in bold) was in the top ten read articles in 2015.

1. L. Minkin, D. Sikes. *Yo -yo jerk dynamics in the vicinity of the lowest point.* The Physics Teacher (accepted for publication).
2. R. Drosd, L. Minkin. *Measuring the coefficient of kinetic friction by exploring dynamics of rotational motion*. The Physics Teacher, vol. 58 (3), 176-178 (2020).
3. L. Minkin, P. Whiting. *Restricted Brachistochrone.* The Physics Teacher, vol. 57, 359-361 (2019)
4. L Minkin, P. Whiting. *Road capacity with a steady-flow traffic.* Physics Education, 53, #5 (2018)
5. L. Minkin, P. Whiting. *Comment on "Approaching the brachistochrone using inclined planes—striving for shortest or equal travelling times"* . Physics Education, vol. 53, #5 (2018)
6. L. Minkin, D. Sikes. *Explanation of Loop the Loop Demonstration with Rolling Radius Correction.* Indian Journal of Physics Education, vol. 34, 1-4, (2018) http://www.physedu.in/uploads/publication/32/456/2.-456-Loop-to-Loop-.pdf
7. L. Minkin, A.S. Shapovalov. *The Electromagnetic Force Between Two Moving Charges.* Physics Education, vol 53, #3, 1-5 (2018), http://iopscience.iop.org/article/10.1088/1361-6552/aaab88/meta
8. **L. Minkin, D. Sikes. *Coefficient of Rolling Friction – Lab Experiment.* American Journal of Physics, vol. 88, #1 (2018), http://aapt.scitation.org/doi/full/10.1119/1.5011957**
9. L. Minkin, D. Sikes. *Measuring the coefficients of kinetic and rolling friction by exploring decay mass-spring oscillations.* Physics Education, vol. 53, #1, 1-6 (2018)
10. http://iopscience.iop.org/article/10.1088/1361-6552/aa8a55/meta
11. W. Dittrich, R. Drosd, L. Minkin, A.S. Shapovalov. *The Law of Entropy Increase - Lab Experiment*. The Physics Teacher. vol. 54, 348 (2016)
12. L. Minkin, A.S. Shapovalov. *Thermo-Diffusional Radon Waves in Soils*. Science of the Total Environment. vol. 565, 1-7, (2016). http://www.sciencedirect.com/science/article/pii/S004896971630824
13. L. Minkin, A.S. Shapovalov. *Vector Addition in Physics*. Physics Education, v. 31, 1-7 (2015). http://www.physedu.in//uploads/publication/19/222/7-VectorAddition-in-Physics.pdf
14. **Drop Tower Physics, William A. (Toby) Dittrich, *The Physics Teacher* Vol. 52, 2014 page 377**
15. Drop Tower Physics II, William A. (Toby) Dittrich, *The Physics Teacher* submitted 2018
16. Jerk on the Loop the Loop, W. Dittrich and K. Mamola, *American Journal of Physics*, submitted 2020
17. Hair Ice: An Interdisciplinary Science, W. A. (Toby) Dittrich, *The Physics Teacher*, under peer review 2020.
18. Introducing Voice Recognition into Education, William A. (Toby) Dittrich and Sequoia Star, *Proceedings of the 5th International Conference on Advances in Higher Education*, HEAD 18, Valencia Spain June 2018.

19. Five US and Canadian Patents, Toby Dittrich, on using Voice Recognition in Education, licensed to Northwest Educational Software, Inc.
20. Drop Tower Physics YouTube Channel, Please take a look ! Teachers around the world are using this classroom tool. https://www.youtube.com/playlist?list=PLRfHZ9wXKs6eiIsULzz-lx20a3Ryq0sHk

Grants

- The Oregon NASA Space Grant funded a two year temporary full-time faculty member in physics and astronomy to develop Physics 121 (The Solar System), 122 (Stars and Galaxies), and 123 (Cosmology) online. The grant required that the courses use open educational resources and meet national accessibility standards. (2015-2016)
- A PCC physics student was awarded a NASA SCORE grant for modeling traffic flow with fluid mechanics (2018).
- Numerous physics students from PCC have received NASA Space Consortium scholarships and/or internships
- District-wide, several physics faculty have participated as mentors for the PCC EXITO Scholars Program, 2016-present

National Committee Involvement

- Toby Dittrich, Member American Association of Physics Teachers, Subcommittee on Astronomy and Space Science, 2015 -2018.
- Toby Dittrich, Member American Association of Physics Teachers, Committee on Undergraduate Physics Education, 2018- present.

Invited Speaker Sessions in National and International Conventions:

- Toby Dittrich, Invited Talks:
  - Modern Eddington Experiment, PNACP Spring Meeting 2016
  - Modern Eddington Experiment, AAPT Summer Meeting, Sacramento 2016
  - Modern Eddington Experiment, AAPT Winter Meeting, New Orleans, 2016
  - Modern Eddington Experiment, AAPT Winter Meeting, Atlanta, 2017
  - Introducing Voice Recognition into Education, Fifth Annual Conference on Advances in Higher Education, University of Valencia, Valencia, Spain, June 2018
  - Modern Eddington Experiment_ Results, AAPT Summer Meeting, San Diego, July 2018
  - Drop Tower Physics, AAPT Spring Oregon Meeting, Mt. Hood CC, February 2019
  - Space Science in the Undergraduate Classroom, AAPT Winter Meeting, Houston, 2019
  - Drop Tower Physics, NW APS Spring Meeting, Bellingham WA, April 2019
  - Should Angular Displacement be a Vector Quantity, AAPT Winter Meeting Orlando, Jan 2020.

Awards

- Lee Collins, received League for Innovation Excellence Award 2017
- Toby Dittrich, PCC Excellence in Teaching Award, (NISOD), 2020.

Conferences

Several physics faculty have attended national conferences and workshops:

- National AAPT Winter Meeting, 2015, 2016, 2017, 2019, 2020
- Mastering Physics Leadership Conference, 2017
- AAPT Spring Meeting, 2019 (Vicki & Laura)
- Vernier Active Learning Workshop, 2018 (Rod) and 2019
- Toby Dittrich, Every national AAPT Meeting since 2015, ten in total. Hosting the 2021 meeting at PCC Sylvania Campus - the first time a community college has hosted a national meeting.
- SE: Vernier Active Learning Workshop, 2016 (Lee)
- League for Innovations Conference, 2017 (Lee)
- Quality Matters Conference Presentation "Making Astronomy Classes Accessible to Visually Impaired Students", 2016 (Rod)

SECTION 5 : PLANNING

OK to add rows to the tables below, but please limit the response to this question to two pages (one front/back)

5A. New Discipline Objectives

Based on the results of your reflection from Part A (Year 1), list any new objectives for the next two years.

Objective	Implementation Timeline	Progress Measures
1. *Increased emphasis on graphical competency across all physics courses.*	Spring SAC Meeting	To be based graphical assessment results
2. Further scrutiny on success rates among various student populations	Fall SAC Meeting	Comparison of future data vs previous years, as provided by IE
3. Assessment of success of remote instruction in physics course for Spring 2020, including student success, best practices, effectiveness of remote labs, and faculty concerns & needs	Fall SAC Meeting	To be based on SAC discussion *Data likely to be requested from IE for evaluation*
4. Update remaining Physics labs at Sylvania to be consistent with the new Vernier Equipment.	2018 by end of summer	212 labs are still referencing PASCO equipment

5B: Resource Requests

List below any resource requests and indicate if these are needed to meet the objectives noted above. Please list in priority order

Resource Request	Approx $	Related to Program Objective? Which?	**Type of Request (check the appropriate boxes)**				
			FT Fac or Staff	Facilities or equip	Other	Ongoing	One time
1. New FT position for Cascade	$50,000		x				
2. Funding for Objective 1	$600	Annual Assessment	x				
3. Additional student data from IE (Objectives 2 & 3)						x	
4. Update remaining FTF Physics labs at Sylvania to be consistent with the new Vernier Equipment. (Objective 4)	tbd			x		x	x

5B1: How will the resource requests support the discipline’s challenges and the objectives identified above?

1. Adding a new FT Physics faculty position at Cascade would even out the pt:ft teaching ratio at this campus. *The SAC is aware of the current state of PCC given the immediate enrollment decline, ongoing SARS-COV2 shutdown and unforeseen budget pressure. However, this single request has been a SAC priority since the 2005 program review and has been ignored.*

2. In its current format, the student learning assessment utilized by the Physics SAC requires a substantial time commitment to correct and analyze. The existing policy of allocating funding for 10hrs is barely adequate to complete grading of the pre-assessment leaving no funding to grade the post-assessment, much less analyze the results. The SAC would like to develop an online version of the assessment that will grade the assessments and present the results in a tabulated format. The development of this online assessment will require a review of available platforms and the identification of the platform most suitable for this project then develop the online assessment. The SAC is requesting 20hr of funding to complete this project.

3. The SAC does have the appropriate data to thoroughly assess student success rates among the various student populations. Additional data would allow the SAC to properly analyze and, if necessary, address concerning trends.

4. Sylvania recently upgraded its Physics lab equipment, switching computer-based data acquisition interface from Pasco to Vernier. Although most of the legacy labs have been updated for the new equipment, not all of the lab assignments are up-to-date.

5B2: Aside from financial support, what do you need from the administration in order to carry out your planned improvements?

1. Referring to above Objectives 2 & 4, the allotment of release time for FT faculty to conduct targeted goals would be one possible way of meeting our resource requests.
2. Re: Objectives 2 & 3 (above), the Physics SAC will be requesting additional and more detailed student data on Physics enrollment and success rates from IE.

****

SECTION 6: Feedback and Follow up
This section is for Administration to provide feedback.

6A. Strengths and successes of the discipline as evidenced by the data, analysis and reflection:

6B. Areas of concern, if any:

See Feedback for Parts A and B on the next page.

6C. Recommended Next Steps:

___ Proceed as planned on discipline review schedule

___ Further review / Out-of-Cycle in-depth review

6D. Additional Comments:

Physics APU 2020 Feedback and Follow up

** Note: This is the combined feedback and follow up for the Physics Pilot A and Pilot B (both completed by the Physics SAC in spring 2020). Since they were answered in the same year, Section 6 questions are the same and the feedback is the same for Pilot A and Pilot B.

SECTION 6: Feedback and Follow up
This section is for Administration to provide feedback.

6A. Strengths and successes of the discipline as evidenced by the data, analysis and reflection:

n.b. Physics SAC members should be applauded for jumping into this "pilot year" of annual program updates. 2020 has been an unusual year for many reasons and the Physics SAC successfully completed both versions of the pilot documentation while the campus was closed and courses were being taught remotely. Feedback from Physics faculty will help the college to improve and to successfully move forward with the new annual program update process. (Thank you!)

The Physics SAC has exceptionally qualified and engaged faculty. This is evidenced by the substantial personal awards earned by faculty (e.g., NISOD Excellence in Teaching, League of Innovation Excellence, others), by the faculty-support for grants ***for student research*** and for curricular innovation (e.g., development of online physics support from a NASA grant), by the out-of-class opportunities made available to students (e.g., EXITO-PSU transfer, and NASA Space Consortium scholarships), by the "un-siloed" work done in collaboration across disciplines (e.g., engineering, geoscience), and by the numerous publications and the presentations at physics conferences. In addition, physics faculty have consistently participated in support of 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.

6B. Areas of concern, if any:

Several actionable items were identified during completion of the 2020 pilot Annual Program Update. Recommended actions are listed in 6D.

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" gateway course. *It will be important to identify in the upcoming months the resources 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 in 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 3 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 probably 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.

3) College-wide class schedule of physics courses
The SAC suggested that some schedule changes are likely to serve students well (perhaps better than in the past) while minimizing the downside consequences of cancelled sections (ie., 102, 103). This is a critical concern and it is one that is especially time sensitive given our current state of 1) fall term closure status due to COVID-19, and 2) the physics faculty shortage at Cascade Campus that has been long ago identified. 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.

6C. Recommended Next Steps:

_X_(See comments below.)_ Proceed as planned on discipline review schedule

____ Further review / Out-of-Cycle in-depth review

6D. Additional Comments:

The 2020 pilot group is finishing only a few months prior to the fall 2020 term when all the SACs will work on their 2020-2021 annual program updates. So, the following comments and recommendations are provided with the expectation that the fall 2020 update from Physics is likely to be little changed from this spring 2020 update, notwithstanding some new 2019-2020 academic year data.

Recommendations related to the critical issues of 6B:

1) If the class schedule changes that were suggested by the SAC have not already been implemented by the time this is read, the Physics SAC Chair and dean liaison can schedule a college-wide discussion of the recommended changes. Recommended participants: Physics SAC Chair, four campus science deans, four campus physics department chairs, and at least one administrative assistant with scheduling experience.

2) Work with the division deans (dean liaison, Dieterich Steinmetz) and 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 question 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.

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.

4) A) It is recommended that the Physics SAC consult with PCC recruiting staff, a team that is newly organized at the college, in order to explore proven strategies to increase enrollment of underrepresented groups.
   B) 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.

   Specifically, consult on issues related to 1) underrepresented groups, 2) pre-physics students and 3) in-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.

Appendix A

Sylvania Campus

Course #	2016-17			2017-18			2018-19		
	F2F	OL	HY	F2F	OL	HY	F2F	OL	HY
PHY 101	10.8			7.3			7.0		
PHY 121	7.2	14.2		7.5	13.5		3.5	16.0	
PHY 122	6.0	11.8		4.0	15.8		2.7	12.2	
PHY 123	2.3	4.5			6.2		3.0	5.4	
PHY 201	23.8			21.8			16.0		
PHY 202	11.5			9.2			7.1		
PHY 203	6.6			6.6			3.9		
PHY 211	56.1			57.7			49.4		
PHY 212	29.5			29.7			29.8		
PHY 213	30.8			29.7			26.8		

Table 2A-1: Enrollments (SFTE) by Year, Modality, and Course for Sylvania Campus

Cascade Campus

Course #	2016-17			2017-18			2018-19		
	F2F	OL	HY	F2F	OL	HY	F2F	OL	HY
PHY 101	14.9			14.7			9.8		
PHY 121	2.1			1.7			1.8		
PHY 201	27.6			26.9			24.8		
PHY 202	11.6			11.4			13.3		
PHY 203	10.4			8.6			10.9		
PHY 211	12.2			7.7			6.1		
PHY 212	5.1			5.4			5.7		
PHY 213	6.7			5.0			6.1		

Table 2A-2: Enrollments (SFTE) by Year, Modality, and Course for Cascade Campus

Rock Creek Campus

Course #	2016-17			2017-18			2018-19		
	F2F	OL	HY	F2F	OL	HY	F2F	OL	HY
PHY 101	10.1		10.6	11.0		8.8	15.4		7.6
PHY 102	3.1								
PHY 103	2.6								
PHY 201	11.4			10.4			10.0		
PHY 202	9.7			7.9			6.5		
PHY 203	8.9			7.7			7.8		
PHY 211	9.2			12.8			16.0		
PHY 212	8.3			12.5			9.1		
PHY 213	8.5			11.8			7.1		

Table 2A-3: Enrollments (SFTE) by Year, Modality, and Course for Rock Creek Campus

Southeast Campus

Course #	2016-17			2017-18			2018-19		
	F2F	OL	HY	F2F	OL	HY	F2F	OL	HY
PHY 101	12.6			12.6			10.1		
PHY 102				1.4			2.6		
PHY 103				2.5			1.4		
PHY 201	13.2			9.2			8.5		
PHY 211	4.6			6.1			3.3		
PHY 212	3.9			5.3			2.9		
PHY 213	3.9			4.1			2.0		

Table 2A-4: Enrollments (SFTE) by Year, Modality, and Course for Southeast Campus

Appendix A

Course #	2016-17								2017-18								2018-19							
	Overall		F2F		Online		Hybrid		Overall		F2F		Online		Hybrid		Overall		F2F		Online		Hybrid	
	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S
PHY 101	444	75.9	365	76.7			79	72.2	409	80.2	343	80.8			66	77.3	375	75.7	318	78.6			57	59.6
PHY 102	24	83.3	24	83.3					11	72.7	11	72.7					20	80.0	20	80.0				
PHY 103	20	90.0	20	90.0					18	94.4	18	94.4					11	100.0	11	100.0				
PHY 121	174	81.6	69	78.3	105	83.8			168	76.8	68	80.9	100	74.0			156	73.1	37	89.2	119	68.1		
PHY 122	137	75.9	46	89.1	91	69.2			153	81.0	31	96.8	122	77.0			115	68.7	21	100.0	94	61.7		
PHY 123	51	62.7	16	81.3	35	54.3			48	62.5			48	62.5			65	81.5	23	87.0	42	78.6		
PHY 201	559	75.1	559	75.1					503	73.6	503	73.6					436	77.1	436	77.1				
PHY 202	246	89.4	246	89.4					214	94.4	214	94.4					201	92.0	201	92.0				
PHY 203	195	94.9	195	94.9					173	96.5	173	96.5					168	92.3	168	92.3				
PHY 211	525	72.0	525	72.0					537	71.3	537	71.3					475	68.4	475	68.4				
PHY 212	309	84.8	309	84.8					346	85.3	346	85.3					312	80.8	312	80.8				
PHY 213	325	79.1	325	79.1					331	84.0	331	84.0					270	84.1	270	84.1				

Table 2B-1: Enrollments (Enrl) and Percent Successful (% S) by Year, Modality, and Course

Course #	2016-17								2017-18								2018-19							
	Male		Female		Non-Binary		Unknown		Male		Female		Non-Binary		Unknown		Male		Female		Non-Binary		Unknown	
	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S
PHY 101	302	73.5	132	80.3			10	90.0	268	79.1	127	83.5	< 5		13	76.9	246	74.8	118	78.0			11	72.7
PHY 102	14	85.7	10	80.0					9	66.7	< 5				< 5		16	81.3	< 5					
PHY 103	11	81.8	9	100.0					13	92.3	< 5				< 5		7	100.0	< 5					
PHY 121	76	80.3	98	82.7					72	83.3	91	71.4			5	80.0	57	82.5	95	67.4			< 5	
PHY 122	56	82.1	81	71.6					54	85.2	96	78.1			< 5		51	64.7	61	72.1			< 5	
PHY 123	24	58.3	26	65.4			< 5		23	73.9	25	52.0					27	96.3	38	71.1				
PHY 201	308	76.0	238	73.1	< 5		12	100.0	249	73.9	247	74.1			7	42.9	211	70.6	216	83.3			9	77.8
PHY 202	127	84.3	109	95.4			10	90.0	110	94.5	104	94.2					91	85.7	105	97.1			5	100.0
PHY 203	91	92.3	98	96.9			6	100.0	86	96.5	84	96.4			< 5		77	90.9	89	93.3			< 5	
PHY 211	424	70.8	95	76.8			6	83.3	431	70.5	98	73.5			8	87.5	369	66.4	92	72.8			14	92.9
PHY 212	238	84.9	69	84.1			< 5		278	84.5	64	87.5			< 5		248	79.8	54	81.5			10	100.0
PHY 213	249	79.1	72	77.8			< 5		263	84.4	62	80.6			6	100.0	215	85.1	48	79.2			7	85.7

Table 2B-2: Enrollments (Enrl) and Percent Successful (% S) by Year, Gender, and Course

Appendix A

2016-17

Course #	AI		AS		BAA		HIS		HPI		INT		WH		2+		UNK	
	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S
PHY 101	< 5		39	82.1	25	72.0	41	70.7	5	100.0	9	66.7	270	75.6	23	73.9	29	79.3
PHY 102			< 5		< 5						< 5		17	88.2	< 5		< 5	
PHY 103							< 5				< 5		15	93.3			< 5	
PHY 121	< 5		5	100.0	7	57.1	18	72.2			< 5		127	82.7	6	100.0	9	77.8
PHY 122	< 5		8	87.5	7	57.1	16	87.5			< 5		86	75.6	8	50.0	10	80.0
PHY 123	< 5		< 5		< 5		8	75.0			< 5		26	80.8	5	20.0	< 5	
PHY 201	< 5		99	80.8	10	60.0	57	68.4	< 5		15	80.0	293	73.4	43	83.7	37	78.4
PHY 202	< 5		60	90.0	< 5		15	86.7	< 5		5	100.0	129	89.1	17	82.4	15	100.0
PHY 203	< 5		61	96.7	< 5		6	100.0	< 5		< 5		91	95.6	16	87.5	11	90.9
PHY 211	6	66.7	44	81.8	16	56.3	55	54.5	< 5		33	87.9	304	72.0	20	80.0	46	73.9
PHY 212	< 5		33	93.9	6	83.3	22	59.1			19	94.7	190	86.3	17	70.6	21	85.7
PHY 213	< 5		35	82.9	11	72.7	20	90.0	< 5		18	88.9	201	79.1	20	70.0	18	72.2

Table 2B-3a: Enrollments (Enrl) and Percent Successful (% S) by Ethnicity and Course for 2016-17

2017-18

Course #	AI		AS		BAA		HIS		HPI		INT		WH		2+		UNK	
	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S
PHY 101	< 5		35	82.9	5	100.0	39	76.9	< 5		16	93.8	235	79.6	39	71.8	33	87.9
PHY 102			< 5										6	66.7	< 5		< 5	
PHY 103			< 5		< 5						< 5		11	90.9	< 5		< 5	
PHY 121	< 5		< 5		< 5		14	78.6	< 5		< 5		120	79.2	13	61.5	9	66.7
PHY 122	< 5		7	71.4	< 5		13	61.5	< 5		< 5		107	86.9	8	62.5	9	66.7
PHY 123			< 5		< 5		< 5						39	66.7	< 5			
PHY 201	5	20.0	72	77.8	19	52.6	53	66.0	5	80.0	13	92.3	274	78.5	35	51.4	27	70.4
PHY 202			44	93.2	6	100.0	18	100.0	< 5		< 5		112	93.8	16	87.5	14	100.0
PHY 203			34	100.0	8	100.0	17	94.1	< 5		< 5		86	96.5	9	77.8	17	100.0
PHY 211	< 5		52	57.7	23	65.2	39	66.7	< 5		36	72.2	314	76.1	20	60.0	51	66.7
PHY 212	< 5		37	89.2	15	66.7	19	73.7	< 5		18	94.4	213	85.9	12	83.3	29	89.7
PHY 213	< 5		27	96.3	12	58.3	23	65.2			18	88.9	205	85.9	13	69.2	31	87.1

Table 2B-3b: Enrollments (Enrl) and Percent Successful (% S) by Ethnicity and Course for 2017-18

2018-19

Course #	AI		AS		BAA		HIS		HPI		INT		WH		2+		UNK	
	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S
PHY 101	< 5		24	66.7	16	50.0	32	68.8	< 5		22	86.4	225	79.6	32	65.6	18	88.9
PHY 102			< 5				< 5						13	84.6	< 5		< 5	
PHY 103			< 5		< 5						< 5		7	100.0				
PHY 121	< 5		5	100.0	5	80.0	9	77.8	< 5		< 5		119	71.4	6	83.3	8	87.5
PHY 122			< 5		< 5		9	66.7			< 5		86	68.6	7	57.1	8	75.0
PHY 123			< 5		< 5		5	80.0			< 5		46	78.3	< 5		6	83.3
PHY 201	< 5		62	87.1	13	53.8	44	70.5	8	62.5	13	84.6	231	78.4	35	74.3	29	72.4
PHY 202	< 5		40	92.5	7	71.4	11	100.0	5	100.0	5	80.0	107	91.6	12	100.0	13	92.3
PHY 203			40	90.0	< 5		10	100.0	< 5		< 5		87	90.8	13	100.0	9	100.0
PHY 211	< 5		61	67.2	17	82.4	42	59.5			33	69.7	255	67.1	20	80.0	46	73.9
PHY 212	< 5		41	85.4	15	80.0	21	81.0	< 5		26	65.4	164	79.3	15	86.7	27	92.6
PHY 213			31	90.3	10	80.0	17	82.4	< 5		15	93.3	142	83.8	18	77.8	35	82.9

Table 2B-3c: Enrollments (Enrl) and Percent Successful (% S) by Ethnicity and Course for 2018-19

Appendix A

Course #	2016-17				2017-18				2018-19			
	Offered		Not Offered		Offered		Not Offered		Offered		Not Offered	
	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S	Enrl	% S
PHY 101	182	75.8	262	76.0	160	71.9	249	85.5	105	72.4	270	77.0
PHY 102	6	66.7	18	88.9	7	85.7	< 5		7	85.7	13	76.9
PHY 103	6	100.0	14	85.7	11	100.0	7	85.7	6	100.0	5	100.0
PHY 121	84	79.8	90	83.3	78	75.6	90	77.8	64	65.6	92	78.3
PHY 122	74	68.9	63	84.1	64	81.3	89	80.9	44	59.1	71	74.6
PHY 123	24	62.5	27	63.0	26	61.5	22	63.6	25	72.0	40	87.5
PHY 201	142	65.5	417	78.4	140	65.0	363	76.9	90	70.0	346	78.9
PHY 202	46	87.0	200	90.0	38	86.8	176	96.0	41	82.9	160	94.4
PHY 203	40	92.5	155	95.5	30	90.0	143	97.9	33	97.0	135	91.1
PHY 211	189	69.3	336	73.5	163	70.6	374	71.7	137	67.2	338	68.9
PHY 212	113	85.8	196	84.2	107	83.2	239	86.2	83	80.7	229	80.8
PHY 213	113	80.5	212	78.3	103	84.5	228	83.8	72	75.0	198	87.4

Table 2B-4: Enrollments (Enrl) and Percent Successful (% S) by Year and Pell Offered