Comprehensive Program Review Report



Program Review - Physics

Program Summary

2022-2023

Prepared by: Quinn MacPherson and Marc Royster

What are the strengths of your area?: The Physics Department offers two physics course sequences to meet the needs of various science and mathematics-based majors. The calculus-based sequence (PHYS 55, 56, 57) is designed for engineering, physics, mathematics and other majors requiring the more advanced level of physics. The algebra/trigonometry-based sequence (PHYS 20, 21) typically meets the needs of biology, health science, and computer science majors, among others.

Additionally, physics aids in promoting transfer by teaching classes that satisfy the UC and CSU group 5A and group B1 requirements respectively. Astronomy ASTR 10 and physical science PSCI 20 satisfy both these requirements. These courses are typically taken by a diverse set of student majors and are highly popular.

All of the courses, except PSCI 20 and PHYS 21, are offered in both the Fall and Spring semester. The courses at the beginning of the calculus and algebra sequences (PHYS 55 and PHYS 20 respectively) have seen increased enrollment and are straining room capacity. This fall semester the second course in the calculus series, PHYS 56, is also straining lab capacity. Please see the "Census Enrollment" plot that is linked. We have resorted to opening new sections (e.g. a second PHYS 20 section in spring 2022) and alternative measures such as live streaming classes so that enrollment can exceed lecture room capacity and having students work in the attached workroom during lab.

So far the increasing enrollment in PHYS 55 and 20 has helped hold up our efficiency numbers while also not turning away students from overfilled courses. However, continued growth will not be possible without adding additional sections.

The physics laboratory is fairly well equipped and new equipment has been acquired through Above-Base and grant funding. These funds have been used to purchase enough equipment for more lab groups to be able to operate at the same time within each lab section. Some additional supplies have been added when the at-home lab kit purchased with covid funds where returned. The physics labs are taught in John Muir 208, which has 8 lab tables. The goal is to have 8 complete setups of each experiment to support full classes and engagement by all students. By having enough equipment, the lab can accommodate more students while providing a meaningful hands-on experience for each student. The funds are also used to upgrade the equipment so students can work with modern data acquisition in addition to traditional methods. A mixture of both provides a well-rounded laboratory experience for the student.

Physics classes have benefited greatly from having active and engaged Supplemental Instructors (SIs). SIs are generally students who have completed the course in a previous semester with a good grade. Statistics provided by Dr. Tracy Redden shows that of all the courses at COS with SIs, physics courses' SIs have the highest percentages of students attending at least one session, high absolute attendance, and some of the greatest correlation with retention, success, and GPA. For example, the percentage of students who attended at least one SI session was 51.8%, 52.6%, 55.6%, and 65% in physics 55, 56, 20, and 21 respectively compared to a 32% average for all courses with SIs. The increase in success rate for students who attended SI vs those who didn't were 28%, 67%, 56%, and -1% respectively as compared to a %12 increase for all courses with an SI.

What improvements are needed?: 1. Increase enrollment and success in the 20/21 sequence

Enrollment in PHYS 20 has been strong, generally filling classes and - in spring 2022 - required an additional section. However, many students who take PHYS 20 do not continue on to PHYS 21 so enrollment is currently only capable of supporting a single PHYS 21 section in the spring with no PHYS 21 offered in the fall semester. Based on surveys and conversations with students a primary reason for the low retention rate is that many major programs require 20 but not 21. Additionally, the success rate in PHYS 20 (Including EW) has been relatively low averaging 59.5% over the past two years.

What should we do to increase success in 20 enrollment in 21?

Instructor time permitting, we plan to reach out to science/math instructors at local high schools with the hopes of setting up a day when we could meet with their students to tell them about COS's physics and engineering programs and do some fun lab demos. It is hoped that this will increase the enrollment of in our PHYS 20 series both through more high school students taking our courses as well as more students choosing COS.

2. Increase enrollment and success in the 55/56/57 sequence

Enrollment in PHYS 55 has been strong and growing. Enrollment in PHYS 56 shows neither a significant upward nor downward trend, it has been subject to significant semester to semester fluctuations. The final course in the sequence, PHYS 57, has had a low enrollment in the last several semesters. There are significant improvements to be made to bring up our success and retention rates in this area as well as analyze the causes of these trends.

To understand enrollment trends in the 55/56/57 sequence it is helpful to analyze enrollment by student cohort. In the attached enrollment by cohort plot we show the enrollment in 55/56/57 grouped by student cohort. For example, the Fall 2021 cohort corresponds to 55 in fall 2021, 56 in spring 2022, and 57 in fall 2022. While some students take a break from physics for a semester or repeat a semester, most students take 55, 56, and then 57 in subsequent semesters. Plotted this way, we see that the recent low enrollment is a result of two effects 1) a large retention drop from 50 to 12 between PHYS 55 and PHYS 56 in the Spring 2021 cohort, and 2) the enrollment in PHYS 55 in Fall 2021 was lower than the preceding and following semesters.

We have investigated the low retention rate for the PHYS 55 class of spring 2021. Part of this drop is due to the low success rate of the semester (50% compared to the 63.5% three year average) driven largely by the large number of covid related extenuating withdrawals. Of the students who passed 55 in spring 21 relatively few went on to take 56 in the fall. We suspect that the primary cause of this low completion and retention rate is the lack of class community in this particular semester. These students were known by the instructor and each other as black zoom boxes. Students from the prior semester would have likely met each other in person in the calculus classes prior to the outbreak of covid and students in the following semester in 55 met each other in person in class. We see that precisely the semester where students who did complete 55 in the spring of 21 did not live in or nearby Visalia and could not take 56 in the fall when it returned to an in-person class.)

A similar explanation explains the low enrollment in 55 the following fall. PHYS 55 has Math 65 (calculus 1) as a prereq. Both success and enrollment in MATH 65 were below average in the Spring of 2021 and those who did pass lacked in-person friends to follow to physics.

In summary, while enrollment in PHYS 55 did not suffer dramatically during the pandemic, the lack of community with it create created aftershocks on retention rates which showed up the following years in PHYS 56/57 enrollment. Fortunately, this community has been restored with students working together in lab, in MESA, in supplemental instructor sessions, and (as is increasingly popular) in the whiteboard-lined hall in John Muir. This restoration of community is evident in the retention rates following in-person classes. If these rebounded retention rates are maintained (and even if they were to fall somewhat) enrollment in PHYS 57 is poised for a healthy increase.

There are a number of actions we hope to take as a department over the next year to continue the increasing enrollment in PHYS 55 and the retention into 56 and 57.

(A) Meet with counseling staff at COS. In this meeting, we will discuss the majors and order of courses that will best prepare students to successfully transfer to physics and engineering programs. We believe this will result in more students enrolling and successfully completing PHYS 56 and 57. We discuss this in more detail below.

(B) Advertise (possibly with a poster in the hall) which courses transfer to which programs at various universities. Often students are unaware that 56 and 57 now transfer to as many places as they do.

(C) Each semester we will analyze the majors and enrollment for the next semester of each of our PHYS 55 and 56 students. We'll then contact students identified by our analysis as potentially benefiting from the next course in the series but not currently enrolled in it. This will keep students from falling trough the cracks and give us additional information about barriers students face in advancing through the sequence.

(D) Prior to scheduling courses for fall 2023 we will meet with representatives from engineering, math, computer science, chemistry, and biology. We'll consider changes to the timing of physics courses that will minimize course conflicts. This has been an issue this fall with PHYS 55 conflicting with one of the sections of MATH 65 and PHYS 57's lab conflicting with MATH 81.

3. Increase the number of students who transfer and do so prepared for their transferring program. As discussed at convocation, COS has seen a rise in the number of students who complete their time at COS and are "transfer ready" but do not in fact transfer on to a university to complete their bachelor's degree. As a physics department, we strive to ensure that students in the physics program as well as students of related majors taking our classes - such as engineers - are not only "transfer ready" but also transfer competitive. To be transfer competitive students need to have majors, coursework, and skills that make them competitive applicants for acceptance to their intended university(s) and have the skills and confidence to succeed when they arrive.

We have identified several improvements to increase the number of transfer competitive students.

We will meet with faculty from the counseling department to discuss majors, recommendations, and requirements relevant to physics and engineering students. Many students have recently been advised to switch their major to "University studies in Math and Science" and we are concerned that this major is not adequately preparing many students to be transfer competitive based on their particular goals. We will also discuss that while certain higher-level math and physics classes may not be technically required for transfer they are critical for transfer competitiveness in many circumstances.

We will continue to increase the opportunities for students to get involved and gain out-of-class skills. For example, we plan to have a LaTeX workshop in FNL. We are also considering creating a Python workshop/minicourse.

We plan to have an event where we invite all physics majors (and people considering a physics major) to discuss opportunities specific to physics.

4. Increase student success through individualized support.

The problem-solving-heavy nature of physics requires individualized or small group tutoring as well as collaborative settings to improve student success. As we argued above, students building a community with their classmates is key to success in courses and continuation on to more difficult courses. The MESA program has been a critical resource for students taking physics courses by providing both a location and a program facilitating students getting help from each other and staff members. This is doubly important because through the process of explaining to others students gain the deep understanding needed to succeed after transfer. Having someone to coordinate the MESA center, act as an academic coach, and assist students in their studies is particularly important in introductory courses to maintain and hopefully improve our student success rate.

5. Increase student engagement in the physics laboratory

Over the last several years, we have been able to use a variety of funding sources to purchase equipment for the physics laboratory. Purchases typically fall within two areas to improve the student experience in the lab and to prepare them for future courses and transfer. The first type of purchase is to modernize the equipment for an experiment that we have already been using; i.e. upgrading 1950's or 1960's equipment with modern digital equipment or just properly-operating, non-worn equipment. The second type of purchase is to add to the experimental repertoire that we can use in the student labs. With the growing repertoire of experiments, better equipment, newly purchased textbooks, and the growing number of students in a lab (e.g. 32 in PHYS 56) we are looking for more storage space for lab equipment. One idea that is under current consideration is installing redesigned cabinets in JM 211. We are currently looking into this option and its cost.

6. Improve student equity by supplying quality texts.

Last year received funds to purchase textbooks for the PHYS 55/56/57 series. This has allowed us to ensure that all students - independent of financial status - have access to quality texts from the first day of class. We use a different text, "College Physics: a strategic approach, 4ed" by Knight, Jones, and Field for the PHYS 20/21 sequence. We are asking for above base funding to buy more copies of the college physics text.

7. Accelerate student grade feedback

Getting assignments graded quickly with individualized feedback increases the chances that students will read feedback and learn from their mistakes/misunderstandings. The online grading platform Gradescope accelerates the process, improves the quality of feedback, and is designed to increase the consistency of grading. In the past, we funded Gradescope using COVID relief funds and are currently using the Dean's discretionary funds (Thanks Francisco!). We are requesting a budget augmentation for this software.

8. Professionally organize, share, and format assignments

To format homework assignments, lab assignments, and exams that have many equations/diagrams it is necessary to have an appropriate text setting program. For this purpose, we use Overleaf, a program that has rapidly because the program of choice in many institutions for its ability to allow documents to be shared with colleagues. We are including this relatively small cost in the same budget augmentation as above.

9. Move lecture and lab times to conform with standard meeting times

We will be moving our lecture and lab times to conform to the standard meeting times that have been circulated. This will minimize time conflicts between courses and thereby allow students to more easily complete their degrees. To do this we will need a student worker for a few hours a week to help set up labs why we are teaching. This is included as an action item.

Describe any external opportunities or challenges.: The statewide MESA program has received a significant budget bust for the MESA programs a colleges that provide matching funds. The physics program is looking for opportunities to work with the MESA center to make the most of this opportunity. For example, having a professor spend a few hours a week in the MESA center working with students - either as part of our usual office hours or additional study time - a portion of our salary could potentially be counted toward the matching funds. Similarly, the textbook purchases could count as well toward COS's contribution to the matching funds.

Physics Department faculty are interested in participating in externally-funded grants to provide research opportunities that suit our faculty strengths and student interest.

Overall SLO Achievement: We updated SLO's for Physics 20, 55, and 57 in spring 2022 based on data from fall 21 and spring 21. The assessment was reported by a new professor, so the results were not directly comparable to previous results. However, these assessments were filled out in much 2021 are more detailed and should make for good comparisons in the future. Student assessments indicate that students are generally performing as expected, but there is always room for improvement.

We will be updating PHYS 21 and PHYS 56 this year.

Changes Based on SLO Achievement: We are always updating/improving our teaching methods. However, we have no additional changes based specifically on SLOs are planned at this time.

Overall PLO Achievement: We assessed PLO's in fall 2021 using data from PHYS 55, 56, and 57. While some assessments were OK, others showed significant room for improvement.

Changes Based on PLO Achievement: One change that Dr. MacPherson made based on the last assessment of PLO's was to switch to assigning two smaller homeworks each week in PHYS 55 rather than one longer one.

Outcome cycle evaluation: We did the assessments last year, we believe this means that it won't be up for a few years. Related Documents:

Census Enrollment.pdf Enrollment By Cohort.pdf Gradescpe.png overleaf.png

Action: Increase degree complete by conforming to standard meeting times. (Student worker)

We are requesting a budget augmentation for a student worker to help set up (and possibly tare down) labs.

Leave Blank: Implementation Timeline: 2022 - 2023 Leave Blank: Leave Blank: Identify related course/program outcomes: Person(s) Responsible (Name and Position): Quinn MacPherson (Associate Physics Professor) Rationale (With supporting data): Priority: High Safety Issue: No External Mandate: No Safety/Mandate Explanation:

Resources Description

Personnel - Classified/Confidential - Hire student worker (Active)

Why is this resource required for this action?: In order to conform with COS's newly circulated standard meeting times, we will be moving our labs 20 minutes earlier. Labs that used to start at 1:30 pm and end at 4:20 pm will start at 1:10 pm and end at 4 pm. However, because we teach lectures during the 12:10-1:00pm hour we will need a student to set up lab so it can be ready at 1:10pm. Even with the current 30-minute spacing, there is often insufficient time for us to set up labs; lab setup in 10 minutes will not be possible. Having a student worker to set up labs between 12:10 and 1:00 pm would alleviate this problem. Having a student set up, and possibly help tare down, labs would also free up time for professors to spend more time on student interaction. The hours for this student could be 3-6hr per week.

Notes (optional):

Cost of Request (Nothing will be funded over the amount listed.):

Link Actions to District Objectives

District Objectives: 2018-2021

District Objective 1.1 - The District will increase FTES by 1.75% over the three years

District Objective 2.1 - Increase the percentage of students who earn an associate degree or certificate (CTE and Non-CTE) by 5 percentage points over three years

District Objective 2.2 - Increase the number of students who transfer to a four-year institution by 10 percent over three years

District Objectives: 2021-2025

District Objective 1.1 - The District will increase FTES 2% from 2021 to 2025.

District Objective 2.1 - Increase the number of students who earn an associate degree or certificate (CTE and non-CTE) by 5% from 2021-2025.

District Objective 2.2 - Increase the number of students who are transfer-ready by 15% and students who transfer to four-year institutions by 10% from 2021-2025.

Action: (2022-2023) Software to accelerate student grade feedback and format assignments.

We plan to apply for budget augmentation for software.

Leave Blank: Implementation Timeline: 2022 - 2023 Leave Blank: Leave Blank: Identify related course/program outcomes: All SLOs. In fact, I use Gradescope when compiling the SLOs. Person(s) Responsible (Name and Position): Quinn MacPherson & Marc Royster Rationale (With supporting data): As the number of students in physics grows, we need a way to maintain equitable grading practices. Gradescope software will help us accomplish this.

There are two different software packages we are requesting funds for. The primary one is Gradescope for accelerating student grade feedback.

Gradescope has a number of advantages over the alternative methods: canvas or paper grading:

- Compared to paper submission, Gradescope allows for the remote submission of homework by students and the turn of homework to students. This reduces the time between when a student does a problem and receives feedback.

- The Gradescope grading interface is user-friendly for the grader making grading faster than with either canvas or paper.

- Gradesope allows for the grader to grade all students' problem 1, then all students' problem 2, etc rather than grading each student's assignment as a hole. Grouping problems this way helps the grader be more consistent on how they grade each problem, making grades more equitable.

- Gradescope incorporates full LaTeX support, including comments tagged to locations on the students' work. Since answers and feedback in physics courses are often in the form of equations this feature is essential.

Gradescope costs \$3/student/semester. For physics, this amounts to under \$900/year at current enrolment rates. Covering physical science will be an additional \$75/year. Some of this cost would be recovered because Gradescope refunds us for students who drop before the end of the semester.

The other software license we would like included in the budget augmentation is Overleaf which is used for formatting,

organizing, sharing, assignments, homeworks, lab handouts, and exams.

Currently, one physics professor has access to Overleaf through his previous institution's general license. Giving both professors access to this platform would allow them to share and write documents with this software. This would cost approximately \$120/year. See the "Personal" license.

See attached documentation. Priority: Medium Safety Issue: No External Mandate: No Safety/Mandate Explanation:

Resources Description

Adjustment to Base Budget - Budget augmentation for software (Active)

Why is this resource required for this action?: As the number of students in physics grows, we need a way to maintain equitable grading practices. Gradescope software will help us accomplish this.

There are two different software packages we are requesting funds for. The primary one is Gradescope for accelerating student grade feedback.

Gradescope has a number of advantages over the alternative methods: canvas or paper grading:

- Compared to paper submission, Gradescope allows for the remote submission of homework by students and the turn of homework to students. This reduces the time between when a student does a problem and receives feedback.

- The Gradescope grading interface is user-friendly for the grader making grading faster than with either canvas or paper.

- Gradesope allows for the grader to grade all students' problem 1, then all students' problem 2, etc rather than grading each student's assignment as a hole. Grouping problems this way helps the grader be more consistent on how they grade each problem, making grades more equitable.

- Gradescope incorporates full LaTeX support, including comments tagged to locations on the students' work. Since answers and feedback in physics courses are often in the form of equations this feature is essential.

Gradescope costs \$3/student/semester. For physics, this amounts to under \$900/year at current enrolment rates. Covering physical science will be an additional \$75/year. Some of this cost would be recovered because Gradescope refunds us for students who drop before the end of the semester.

The other software license we would like included in the budget augmentation is Overleaf which is used for formatting, organizing, sharing, assignments, homeworks, lab handouts, and exams.

Currently, one physics professor has access to Overleaf through his previous institution's general license. Giving both professors access to this platform would allow them to share and write documents with this software. This would cost approximately \$120/year. See the "Personal" license.

See attached documentation. Notes (optional): Cost of Request (Nothing will be funded over the amount listed.): 1120 Related Documents: Gradescpe.png overleaf.png

Link Actions to District Objectives

District Objectives: 2018-2021

District Objective 1.1 - The District will increase FTES by 1.75% over the three years

District Objectives: 2021-2025

District Objective 1.1 - The District will increase FTES 2% from 2021 to 2025.

District Objective 2.1 - Increase the number of students who earn an associate degree or certificate (CTE and non-CTE) by 5% from 2021-2025.

District Objective 2.2 - Increase the number of students who are transfer-ready by 15% and students who transfer to four-year institutions by 10% from 2021-2025.

Action: (2022-2023) Address inequitable textbook axcess in PHYS 20/21

Purchase Textbooks for PHYS 20/21

Leave Blank:

Implementation Timeline: 2022 - 2023 Leave Blank: Leave Blank:

Identify related course/program outcomes: All outcomes for PHYS 20 and PHYS 21 will be benefited by these texts. **Person(s) Responsible (Name and Position):** Quinn MacPherson

Rationale (With supporting data): Last year received funds to purchase textbooks for the PHYS 55/56/57 series. This has allowed us to ensure that all students - independent of financial status - have access to quality texts from the first day of class. We use a different text, "College Physics: a strategic approach, 4ed" by Knight, Jones, and Field for the PHYS 20/21 sequence. The MESA center was able to obtain 10 coppies of the textbook with their funds. However, in fall 2022 the MESA center loaned out all of their copies and there were remaining students who were unable to borrow a copy. Funds permitting - we would like to purchase additional copies of this text.

The price of used texts varies with time and orders are often limited resulting in texts not all costing the same amount. Currently, Knight is being sold used on Amazon for \$120/copy. We would like an additional 15 copies. At a total cost of about \$1800+tax/shipping.

Priority: Medium Safety Issue: No External Mandate: No Safety/Mandate Explanation:

Resources Description

Equipment - Instructional - Textbooks to loan out to students. (Active)

Why is this resource required for this action?: Last year we received funds to purchase textbooks for the PHYS 55/56/57 series. This has allowed us to ensure that all students - independent of financial status - have access to quality texts from the first day of class. We use a different text, "College Physics: a strategic approach, 4ed" by Knight, Jones, and Field for the PHYS 20/21 sequence. The MESA center was able to obtain 10 copies of the textbook with their funds. However, in fall 2022 the MESA center loaned out all of their copies and there were remaining students who were unable to borrow a copy. Funds permitting - we would like to purchase additional copies of this text.

The price of used texts varies with time and orders are often limited resulting in texts not all costing the same amount. Currently, Knight is being sold used on Amazon for \$120/copy. We would like an additional 15 copies. At a total cost of about \$1800+tax/shipping.

These texts will be loaned out many times so should serve the college for many years.

Notes (optional): Cost of Request (Nothing will be funded over the amount listed.): Related Documents: CollegePhysicsKnight.PNG

Link Actions to District Objectives

District Objectives: 2018-2021

District Objective 1.1 - The District will increase FTES by 1.75% over the three years

District Objective 2.1 - Increase the percentage of students who earn an associate degree or certificate (CTE and Non-CTE) by 5 percentage points over three years

District Objectives: 2021-2025

District Objective 1.1 - The District will increase FTES 2% from 2021 to 2025.

District Objective 2.1 - Increase the number of students who earn an associate degree or certificate (CTE and non-CTE) by 5% from 2021-2025.

District Objective 2.2 - Increase the number of students who are transfer-ready by 15% and students who transfer to four-year institutions by 10% from 2021-2025.

Action: (Completed 2021-2022) Support increased student enrollments, success, transfer, and degree completion in physics. (Replacement Faculty Member)

(Replacement Faculty Member)

Leave Blank: Implementation Timeline: 2021 - 2022 Leave Blank: Leave Blank:

Identify related course/program outcomes: District Objective 1.1 - The District will increase FTES by 1.75% over the three years District Objective 2.1 - Increase the percentage of students who earn an associate degree or certificate (CTE and Non-CTE) by 5 percentage points over three years

District Objective 2.2 - Increase the number of students who transfer to a four-year institution by 10 percent over three years **Person(s) Responsible (Name and Position):** Quinn MacPherson

Rationale (With supporting data): To support student needs in physics and other courses taught by physics faculty (astronomy, natural science, and physical science), the physics department needs at least two full-time faculty (in addition to the full-time engineering faculty member). Current course offerings provide load (plus overload) for two full-time physics faculty, plus courses for one or more adjunct faculty. Having two full-time physics faculty allows us to continue offering the expanded course offerings in the two majors physics sequences (20/21 and 55/56/57) that has increased enrollments and facilitated improved student scheduling and degree completion. The physics sequences are needed for ASTs in biology, mathematics, chemistry, computer science, engineering, and physics.

The CCC Chancellor's Office is working with the University of California system in developing a UC Guaranteed Transfer Pathway for Physics. The draft template closely matches our current offerings, so this may become an attractive incentive for increasing numbers of transfer students. This will likely increase demand for our courses and the physics major.

The position being requested is for a replacement for a faculty member who retired in the spring of 2021 and was replaced with a one-year full-time temporary faculty member. We are requesting the replacement position to support students by continuing to cover physics and astronomy program offerings.

Priority: High Safety Issue: No External Mandate: No Safety/Mandate Explanation:

Resources Description

Personnel - Faculty - Higher replacement faculty. (Active)

Why is this resource required for this action?: To support student needs in physics and other courses taught by physics faculty (astronomy, natural science, and physical science), the physics department needs at least two full-time faculty (in addition to the full-time engineering faculty member). Current course offerings provide load (plus overload) for two full-time physics faculty, plus courses for one or more adjunct faculty. Having two full-time physics faculty allows us to continue offering the expanded course offerings in the two majors physics sequences (20/21 and 55/56/57) that has increased enrollments and facilitated improved student scheduling and degree completion. The physics sequences are needed for ASTs in biology, mathematics, chemistry, computer science, engineering, and physics.

The CCC Chancellor's Office is working with the University of California system in developing a UC Guaranteed Transfer Pathway for Physics. The draft template closely matches our current offerings, so this may become an attractive incentive for increasing numbers of transfer students. This will likely increase demand for our courses and the physics major.

The position being requested is for a replacement for a faculty member who retired in the spring of 2021 and was replaced with a one-year full-time temporary faculty member. We are requesting the replacement position to support students by continuing to cover physics and astronomy program offerings.

Notes (optional): Cost of Request (Nothing will be funded over the amount listed.): Related Documents: Gradescpe.png overleaf.png

Link Actions to District Objectives

District Objectives: 2018-2021

District Objective 1.1 - The District will increase FTES by 1.75% over the three years

District Objective 2.1 - Increase the percentage of students who earn an associate degree or certificate (CTE and Non-CTE) by 5 percentage points over three years

District Objective 2.2 - Increase the number of students who transfer to a four-year institution by 10 percent over three years

District Objectives: 2021-2025

District Objective 1.1 - The District will increase FTES 2% from 2021 to 2025.

District Objective 2.1 - Increase the number of students who earn an associate degree or certificate (CTE and non-CTE) by 5% from 2021-2025.

District Objective 2.2 - Increase the number of students who are transfer-ready by 15% and students who transfer to four-year institutions by 10% from 2021-2025.

Action: (Completed 2021-2022) Increase student engagement in the physics laboratory. (Equipment for speed of light experiment)

Buy equipment for making speed of light lab.

Leave Blank: Implementation Timeline: 2021 - 2022 Leave Blank: Leave Blank: Identify related course/program outcomes: Person(s) Responsible (Name and Position): Quinn MacPherson

Rationale (With supporting data): Two of the central topics for PHYS 57 are relativity and optics. A lab measuring the speed of light by shining a laser beam across a room and back and detecting it with a high-speed photodetector is an essential lab for (and the only practical lab) for the relativity topic. It is also a good optics lab. We currently own a single setup for measuring the speed of light that was purchased from PASCO scientific. The way the course is currently being taught is to have the student

groups take turns performing the experiment over multiple weeks of the lab. This is sub-optimal for pedagogical purposes and organizational purposes. We are requesting funds to purchase up to 3 additional setups.

If we were to order 3 more of our current setup from PASCO they would cost \$6500 each. However, by order parts from THOR LABS and Amazon and utilizing equipment already owned by the college we are able to make new setups at a cost of approximately \$550 each. We are requesting \$1500 to purchase this equipment. Each setup would include a high-speed photodetector (Thor labs DET025A \$230), a power supply (Thor labs DET2B \$125), a mirror (Thor labs ME1-G01 \$15), a gimbal mount (Thor labs KM100CP \$77), a few minor parts from the hardware store/amazon (<\$50), as well as some extra funds to account for shipping and price changes between now and approval time. If budget limitations prevent us from getting all \$1650, at least having enough for one or two additional setups would be quite helpful.

In addition to their use for the speed of light experiment, this equipment would be useful for other labs involving photogates. Furthermore, the mounts can be refitted with other low-cost optics, reducing our future reliance on high-priced PASCO equipment.

Priority: Medium Safety Issue: No External Mandate: No Safety/Mandate Explanation:

Resources Description

Equipment - Instructional - Purchase equipment for speed of light lab (Active)

Why is this resource required for this action?: Two of the central topics for PHYS 57 are relativity and optics. A lab measuring the speed of light by shining a laser beam across a room and back and detecting it with a high-speed photodetector is an essential lab for (and the only practical lab) for the relativity topic. It is also a good optics lab. We currently own a single setup for measuring the speed of light that was purchased from PASCO scientific. The way the course is currently being taught is to have the student groups take turns performing the experiment over multiple weeks of the lab. This is sub-optimal for pedagogical purposes and organizational purposes. We are requesting funds to purchase up to 3 additional setups.

If we were to order 3 more of our current setup from PASCO they would cost \$6500 each. However, by order parts from THOR LABS and Amazon and utilizing equipment already owned by the college we are able to make new setups at a cost of approximately \$550 each. We are requesting \$1500 to purchase this equipment. Each setup would include a high-speed photodetector (Thor labs DET025A \$230), a power supply (Thor labs DET2B \$125), a mirror (Thor labs ME1-G01 \$15), a gimbal mount (Thor labs KM100CP \$77), a few minor parts from the hardware store/amazon (<\$50), as well as some extra funds to account for shipping and price changes between now and approval time. If budget limitations prevent us from getting all \$1650, at least having enough for one or two additional setups would be quite helpful.

In addition to their use for the speed of light experiment, this equipment would be useful for other labs involving photogates. Furthermore, the mounts can be refitted with other low-cost optics, reducing our future reliance on high-priced PASCO equipment.

Notes (optional): Cost of Request (Nothing will be funded over the amount listed.): 1650 Related Documents: SpeedOflightOrders.pdf

Link Actions to District Objectives

District Objectives: 2018-2021

District Objective 1.1 - The District will increase FTES by 1.75% over the three years

District Objective 2.2 - Increase the number of students who transfer to a four-year institution by 10 percent over three years

District Objectives: 2021-2025

District Objective 1.1 - The District will increase FTES 2% from 2021 to 2025.

District Objective 2.1 - Increase the number of students who earn an associate degree or certificate (CTE and non-CTE) by 5% from 2021-2025.

District Objective 2.2 - Increase the number of students who are transfer-ready by 15% and students who transfer to four-year institutions by 10% from 2021-2025.

Action: (Completed 2021-2022) Support for student success in physics laboratory activities. (Accessories for the high-speed camera)

Purchase accessories for our high-speed camera.

Leave Blank:

Implementation Timeline: 2021 - 2022 Leave Blank: Leave Blank:

Identify related course/program outcomes:

Person(s) Responsible (Name and Position): Quinn MacPherson

Rationale (With supporting data): This year we would like to request accessories for the high-speed camera the department already owns. The high-speed camera is an excellent pedagogical tool for lab demos for waves on strings (PHYS 55, PHYS 57, PHYS 20, and potentially PSCI 20) as well as quickly rotating objects (PHYS 55 and PHYS 20). However, due to the high frame rate, a bright light source is needed. The high-speed camera is also useful for various Friday Night Lab activities. Currently, we are using a light source that Dr. MacPherson is borrowing from a personal friend. As this is not a long-term solution, we are requesting funds for a mounted light as well as a Macro lens for a close-up photograph total of \$529 from Amazon. (\$230 for the light, \$22 for the mount, and \$277 for the lens.)

Priority: Medium Safety Issue: No External Mandate: No Safety/Mandate Explanation:

Resources Description

Equipment - Instructional - Buy accessories for our high-speed camera. (Active)

Why is this resource required for this action?: This year we would like to request accessories for the high-speed camera the department already owns. The high-speed camera is an excellent pedagogical tool for lab demos for waves on strings (PHYS 55, PHYS 57, PHYS 20, and potentially PSCI 20) as well as quickly rotating objects (PHYS 55 and PHYS 20). However, due to the high frame rate, a bright light source is needed. The high-speed camera is also useful for various Friday Night Lab activities. Currently, we are using a light source that Dr. MacPherson is borrowing from a personal friend. As this is not a long-term solution, we are requesting funds for a mounted light as well as a Macro lens for a close-up photograph total of \$529 from Amazon. (\$230 for the light, \$22 for the mount, and \$277 for the lens.) We round up to \$550 for the total cost to account for price increase by time of approval.

Notes (optional): Cost of Request (Nothing will be funded over the amount listed.): 550 Related Documents: HighSpeedCameraExtras.pdf

Link Actions to District Objectives

District Objectives: 2018-2021

District Objective 1.1 - The District will increase FTES by 1.75% over the three years

District Objective 2.2 - Increase the number of students who transfer to a four-year institution by 10 percent over three years

Action: 2022-2023 Improve Lab Environment

Replace broken lab chairs (35)

Leave Blank: Implementation Timeline: 2022 - 2023

Leave Blank: Leave Blank: Identify related course/program outcomes: Person(s) Responsible (Name and Position): Quinn MacPherson and Francisco Banuelos Rationale (With supporting data): Many of the lab chairs are broken or have missing/loose bolts Priority: High Safety Issue: Yes External Mandate: No Safety/Mandate Explanation:

Resources Description

Equipment - Instructional - 35 armless lab chairs (Active)

Why is this resource required for this action?: safety and maximizing learning Notes (optional): Cost of Request (Nothing will be funded over the amount listed.): 30000

Link Actions to District Objectives

District Objectives: 2021-2025

District Objective 1.1 - The District will increase FTES 2% from 2021 to 2025.

District Objective 2.1 - Increase the number of students who earn an associate degree or certificate (CTE and non-CTE) by 5% from 2021-2025.

District Objective 2.2 - Increase the number of students who are transfer-ready by 15% and students who transfer to four-year institutions by 10% from 2021-2025.