Instructional Program Review Report
Sierra College, 2019-2020

Department/Program Name: Physics

Date Submitted: 02/01/2020

Submitted By: Aviva Shackell

Ideally, the writing of a Program Review Report should be a collaborative process of full-time and part time faculty as well as all other staff and stakeholders invested in the present and future success of the program at all sites throughout the district. The Program Review Committee needs as much information as possible to evaluate the past and current performance, assessment, and planning of your program.

Please attach your Department Statistics Report (DSR) and your planning report with your Program Review.

1) Relevancy: This section assesses the program's significance to students, the college, and the community.

1a) To provide context for the information that follows, describe the basic functions of your program.

The Physics program largely serves transfer students. The courses offered by the department provide general science credits for transfer, and pre-requisite courses for health care professionals, the biological sciences as well as for engineers and physical sciences.

The physics curriculum serves many of the "Top Twenty-Five Best College Majors for a Lucrative Career" as cited by Kiplinger in 2019:
https://www.kiplinger.com/slideshow/business/T012-S001-best-college-majors-for-a-lucrative-career-2019/index.html

If applicable, also describe how the program aligns with state mandates, priorities set by external agencies, or any other relevant organizations.

N/A

1b) How does your program support the District Mission, Vison Statement, and Core Values, quoted below?

Sierra College Mission

The mission of Sierra College is to provide an inclusive and safe educational environment where learners are supported while challenging themselves and achieving their goals.

Sierra College Vision Statement

Sierra College will be the preferred destination for higher education and training in our region while eliminating achievement gaps among our students

Sierra College Core Values

The following core values will establish our ethical principles and will guide our institutional decision-making. Sierra College will:

1. Empower students in their education.
2. Strive toward student success and continuous improvement.
3. Be an inclusive and equitable community.
4. Be responsive to the education and workforce needs of our local community and businesses.
5. Demonstrate collaboration with all stakeholders in decision making.
6. Manage all resources in a manner that is sustainable and responsible.
7. Support and model excellence and innovation in teaching, learning, scholarship, and creativity.

The physics program aligns with the mission, vision, and core values in the following ways:

It provides inherently challenging material with a lot of necessary academic guidance. The subject matter of physics can be very academically challenging for students so the physics department has made the student support piece a priority. We have strived to create a successful and inclusive environment for our students. One example is the physics departments tutoring center that is staffed with hand-picked students from 8:30am-4:30pm M-F. This timeframe coincides with our open lab time hours which is overseen by our instructional assistant at all times as well as our many full time and part time faculty lab hours (each lab class has 2 lab hours associated with it) and office hours. All of our faculty offices and the tutoring center are either connected to or within steps to the open lab. The resources and their immediate proximity with respect to one another has led to an active and thriving physics area and community where classes/labs/faculty/tutors are all within literal and figurative reach of the student. This allows for many different avenues for students to achieve their goals in a supported environment where they can successfully pass their physics classes and transfer.

The physics department services the transferring student. Of students that have successfully completed one physics course 230[1] transfer to a four year institution per academic year.

A sense of how successful the physics department is at eliminating achievement gaps amongst students is found by comparing data of success and retention as presented by the equity portion of the dashboards over the last three years. That analysis is done in section 3c, and shows the physics department success rates overall are higher than Sierra College by an order of 1-2% across all ethnic populations.[2] This does indicate a successful decrease in achievement gaps as compared to the college as a whole.

[1] This is an average value calculated from data in part 1d ranging from Fall 2009 to Spring 2018.
[2] This excludes the gender specific analysis in section 3c that performs a similar analysis within the female population that mimics an ongoing issue in all physics departments nationwide.

In general the Physics department strives and actively works towards bettering the student experience and success.

1c) Please describe how your program supports ISLOs (Institutional Student Learning Outcomes): Communication, Technology and Information Competency, Critical and Creative Thinking, and Citizenship?

Our four Program Outcomes link most strongly with the ISLO's associated with technical competency and critical thinking as physics requires well developed critical thinking skills to be successful. We link with the mission as stated by our strong role in transfer.

1d) Program offerings align with which of the following mission categories; check all that apply:

X Transfer ☐ Career Technical Education X AA/AS/T/Certificates
☐ Basic Skills ☐ Personal Development/Enrichment. ☐ Lifelong Learning

Please analyze your department's performance in supporting the mission categories marked in (1d) above. Provide evidence in support of this analysis, including data from the dashboard relevant to this evaluation. Relevant data includes the equity and diversity goals of the department and College.

If any of the following apply to your program, please address them in your analysis.

- Degrees, certificates, and/or licenses your department has generated:
  - The alignment of these awards with the district's mission and/or strategic goals. (See the district "Awards Data File, available from Research and Planning, for your numbers).
- Job placement or labor market information for your program's awards and licenses.
- The contribution your program makes to student transfer.
- Participation in basic skills programs.

Please address any developments related to Guided Pathways and Interest Areas that have impacted and/or will impact your program's support for these goals.

The Physics Department has course offerings to meet the needs of engineering and physical science majors (the Physics 205-215 sequence), biology and health care professional majors (the Physics 105 and 110 sequence), a general science credit for transfer (Physics 10), and a physics course for students who did not take a high school physics course looking to transfer into Physics 205 (Physics A).

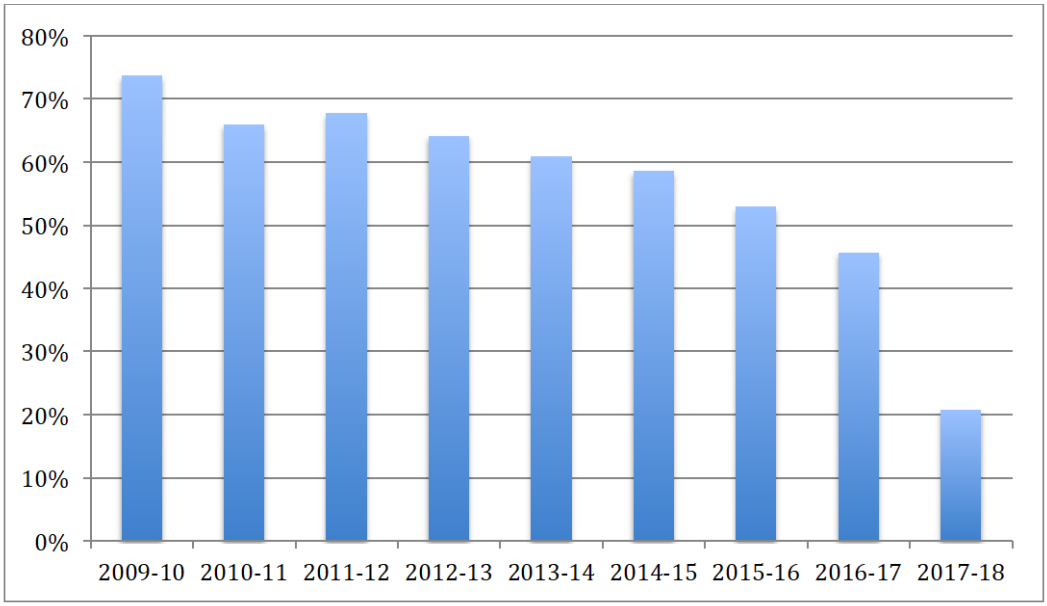
The table below shows the number of degrees awarded in Physics in the previous 3 years.

Majors	2016-2017	2017-2018	2018-2019	3 Yr Avg
Physics	20	13	9	14
Physics for Transfer	4	10	10	8

The number of degrees awarded in physics does not accurately represent the number of students we transfer or service as physics majors are possibly the smallest percentage of the students we serve.

In addition the physics department has been involved in the guaranteed transfer pathway or UCTP and is amongst the first to create this pathway and have students apply.

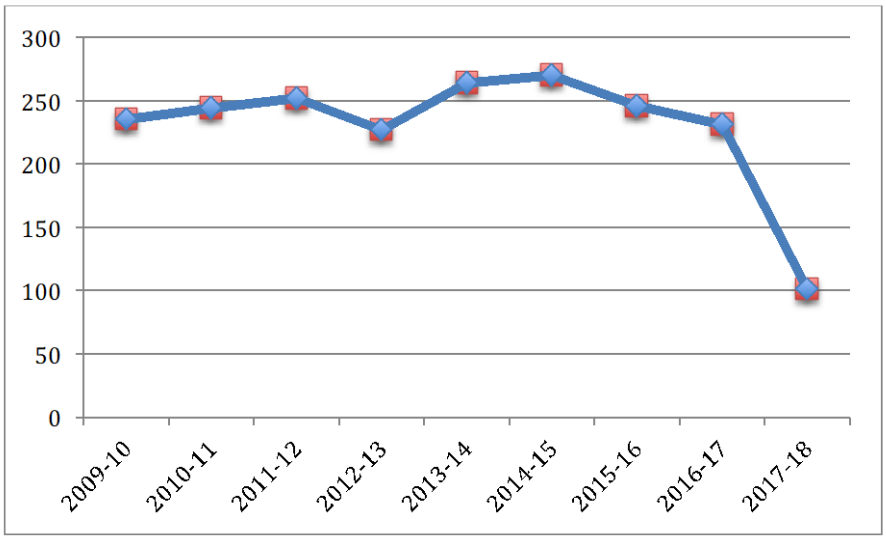
Percentage of students that have completed one physics course in an academic year that have successfully transferred to a 4 year institution.



Above we present transfer information for the physics department. This graph represents students that have successfully taken one physics course and then transferred at some point to a four-year institution.[3] Our percentages are high and we consistently transfer many students bodies as seen below:

[3] Please note that many of the 16-17 and 17-18 cohorts of students are likely still enrolled at Sierra and therefore the data set is not complete as some will still likely transfer.

Number of students that have completed one physics course in an academic year that have successfully transferred to a 4 year institution.



Please note it is a future goal of the department to analyze this data with an equity outlook as well as to investigate what looks like an overall decrease in transfer rate (excluding the last to academic years).

1e) Optional Additional Data: Describe any other relevant contributions of your program to the district mission, goals, outcomes, and values not incorporated in the answers above. Examples include but are not limited to contributions to student equity and success, diversity, campus climate, cultural enrichment, community ties, partnerships and service. Please include specific data and examples when these are available and relevant to the analysis.

Over the past three years the department has continued to be a popular part of the Natural History Museum's Dinosaur Day. Professor Randall has represented the physics department in this important event and his Physics Demonstration shows play to packed houses of excited children and parents.

In conjunction with the engineering department an Internship/Transfer seminar has been developed. This involves bringing students back to Sierra College after transfer to give aid/help to future transfer students. In the fall they will present about internships they have had in the summer between Sierra and transfer, and in the fall present about their transfer experience and about skills that are important upon transfer.

2) <u>Currency</u>: This category assesses the currency of program curricula and instruction as dictated by Title 5 and the currency of efforts in meeting accreditation standards as well as improving pedagogy and engaging in professional development.

2a) Curriculum: Describe any developments in your program's curricula since the last Program Review, including discussion of any projected changes. Please describe the process and criteria for curriculum development and review, including state and/or professional mandates, for developing, evaluating and revising curriculum, including the use of SLOs. Please note as part of this analysis if you have completed Curriculum Review.

Our curriculum is generally current and typically very steady. There have been some minor changes to Curriculum as mentioned below along with their justifications. We will be going through Curriculum Review in the 2020-2021 academic year which will likely involve minor changes.

All of our course offerings, and the content of those courses, are aligned with the requirements of the transfer model curriculum (see www. C-id.net). In addition, our course offerings articulate with the University of California system.

Beginning in the Fall semester of 2018, Physics A changed from a 3 unit course to a 4 unit course and now include a required weekly recitation section along with changing its name from "Foundations of College Physics" to "Prep for Calc-Based Physics". These changes were made in an effort to increase the rigor of the Physics A course and to encourage students to take Physics A instead of Physics 105 as a pre-requisite for Physics 205. Physics A is more desirable than 105 as its units are not transferrable and will not affect possible limitations associated with unit limits upon transfer. A concerted effort is simultaneously being made to make Physics A as comparable to Physics 105 as possible since an analysis of data from the research division in 2017 comparing the success of students taking Physics 105 vs Physics A as a pre-requisite to Physics 205 significantly indicated a greater success in the Physics 205 course with Physics 105. *See table below*

Earned Grade in Prerequisite Course	**Phys A**	**Phy 105**
A	**68%(69)**	**91%(33)**
B	**60%(53)**	**65%(49)**
C	**40%(38)**	**71%(21)**
Total	**59%(168)**	**73%(111)**

In a few more years when there is enough data to analyze with the new changes to Physics A, the physics department will revisit the status of the success rates of students in subsequent course Physics 205 and adjust accordingly.

In Fall 2018 the department added a general one-semester physics/chemistry course (C-ID PHYS/CHEM 140) that satisfies the physical science requirements of future elementary school teachers. The goal of this course was to drastically reduce the number of course units from the present value of nine to four in better alignment with transfer model curricula. Unfortunately, there was pushback from the counselors after the development of the class since certain local state universities (not all) did not accept the course. More research into the matter is being done and for now Physics 140 remains a class that has not yet been taught.

As relevant, please address the impact of the development of Interest Areas and Guided pathways on curriculum and program planning and assessment

As mentioned above we have been cultivating Physics A as a better pre-requisite for Physics 205 as compared to Physics 105. Under the guided pathway view it is more desirable since there are less math pre-requisites, has less units, it can be taken at any time, and the units are not transferrable thus it will not affect possible limitations associated with unit limits upon transfer.

2b) Student Learning Outcomes Assessment: Analyze your program's assessment of course outcome, analysis of results, and improvements/changes made to the program as a result of this assessment. Please provide specific data and analysis in the space provided.

As of this report we are current with all of our SLAS/DAA reporting. Typically during the SLO cycle we address problems specific to physics courses like sig fig reporting, ability of students to read graphs, and the ability of students to problem solve and use critical thinking. We make adjustment to our curriculum as needed based on our analysis and typically will find greater degrees of success as a result. We map our results to the relevant CSLO's and ISLO's, etc.

It should be mentioned that a more rigorous and thorough outcome assessment is done through our in-house department discussions. These discussions are ones that typically result in a follow up to the research department, in house surveys, or analysis of existing data. In this way we have come to understand and make recommendations to our students and counselors in an educated way regarding curriculum above and beyond the SLAS framework. Examples include answering questions like; which math class makes a student more effective in various classes, is there a difference in success if students take 210 or 215 first, which HS's produce the most prepared students, or does Phys A or Phys 105 prepare a student better for 205. The list goes on.

In the space below, please describe or attach the cycle you have developed for outcomes assessment. You can also attach the cycle as a PDF or other file.

Course	Fall 17	Sp 18	Fall 18	Sp 19	Fall 19	Sp 20
Physics A	☐	☐	☐	X	☐	☐
Physics 10	☐	☐	☐	X	☐	☐
Physics 105	☐	X	☐	☐	☐	☐
Physics 105L	☐	☐	X	☐	☐	☐
Physics 110	☐	X	☐	☐	☐	☐
Physics 110L	☐	☐	X	☐	☐	☐
Physics 205	☐	☐	☐	☐	☐	X
Physics 205L	X	☐	☐	☐	☐	☐
Physics 210	☐	☐	☐	☐	☐	X
Physics 210L	X	☐	☐	☐	☐	☐
Physics 215	☐	☐	☐	☐	☐	X
Physics 215L	X	☐	☐	☐	☐	☐

Physics 215R	☐	☐	☐	☐	X	☐
Physics 10L	☐	☐	☐	X	☐	☐
Physics 210R	☐	☐	☐	☐	X	☐

2c) Professional development: Please describe how your department's individual and group activities and professional development efforts, including Flex activities, serve to improve teaching, learning and scholarship.

Department Meetings: The department meetings are a fundamental part of oiling the machinery of our teaching and learning network. In true collaborative fashion our meetings are used to compare observations of student performance, note any overall patterns in these results, and alter our teaching methodology in ways to maximize learning opportunities for our students. As a department, this group comparison of information allows us to recognize the strengths and weaknesses of our teaching strategies and alter them, thus improving teaching, learning and scholarship.

Conferences
Department members routinely attend the semi-annual meetings of the Northern California Section of the American Association of Physics Teachers (AAPT).

Dominic Calabrese and one of his former Physics 205 students, Abdallah El Idrissi, have published a paper in a physics education journal called "The Physics Teacher." It will appear in the March 2020 edition of the journal. This was a result of an Honors contract that Abdallah completed in Fall 2018. Their results were also presented and a local and national meeting of the America Association of Physics Teachers in 2019.

Dominic is currently involved in a research project with his past Ph.D advisor at the University of Nebraska-Lincoln. They will be presenting their results at a conference in June 2020.

Other: Every faculty member reads journals, eg The Physics Teacher, books eg An Interesting Question, and list servers on the net in an on-going effort to remain current and to add texture to their classroom presentations.

Please describe any staff development needs you have identified based on this analysis.

One staff development need that has been identified as necessary is help/training/developing specific curriculum with an equity eye as particular to STEM majors.

Another is based around the increasing special needs/mental health population in the classroom. This population is on the rise and we often find ourselves without the tools necessary to handle issues specific to that particular population.

We have also recently realized that there is a real need in the ex-convict population here at Sierra. There is not a lot of data out there and I have reached out to Erik Cooper to help us understand the issue. We recognize that there is a need for support beyond what exists already for this population of student as they face a unique set of problems; unable to apply for

internships, gain employment easily, and typically face economic insecurity. Any aid or development in this regard would be appreciated.

I feel like at this time in the report it is relevant to discuss the frustration our department (and other STEM departments) feel with regard to the time allotted to us for professional development. With the heavy workload we have there is often no time for these types of activities. This is exacerbated by a culture of working overloads, systemic under-loading with regard to laboratories and multi-section classes, and a culture of adding students above the course cap. The quantity and quality of our load does not allow for this kind of professional development in an easy way.

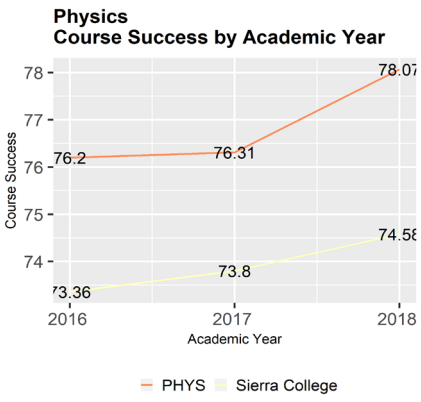
2d) Optional Additional Information: Please describe and explain any additional information that supports your evaluation of your program's success.

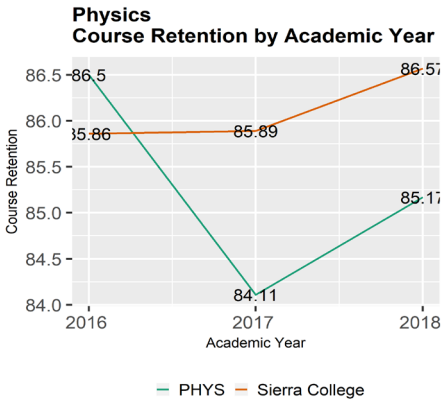
N/A

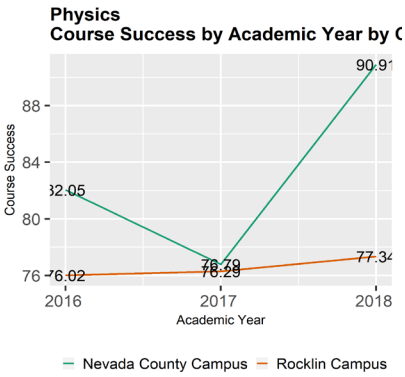
3) <u>Effectiveness</u>: This section assesses the effectiveness of the program in light of traditional measurements.

3a) Retention and Success: Assess and evaluate the three-year trends in your program's data contained in the DSR and analyze any relevant information found in the data dashboard related to retention and success. Please include the results of any relevant outcomes assessments, as appropriate. Address separately the data for on ground and online courses, as well as the data for the campus or centers at which you operate. Please describe any challenges experienced by your program. If you determine that you need to improve the program's performance, please describe how you plan to achieve this goal.

Please reference the three graphs below.







The three-year general trend associated with student success is generally above the Sierra college average. Student retention is typically at or below the average. Student success is greater at the NCC campus vs the Rocklin campus (typically 2/36 sections are offered at NCC per semester). We only offer courses at NCC and Rocklin.

We are pleased with the physics department success as a whole, but retention clearly is an issue to address. In a difficult subject like physics this is not unusual and similar trends can be seen in Chemistry and Biology, see below. This common trend indicates this may be a trait of STEM classes in general.

	Fall 16 retention	Fall 17 retention	Fall 18 retention	Average retention
Phys	83.78	84.56	84.35	84.23
Chem	85.38	86.65	84.70	85.58
Bio	82.58	82.21	85.35	83.38

As relevant, please address your program's role in the development of Interest Areas and Guided pathways and the impact of these developments on program planning and assessment.

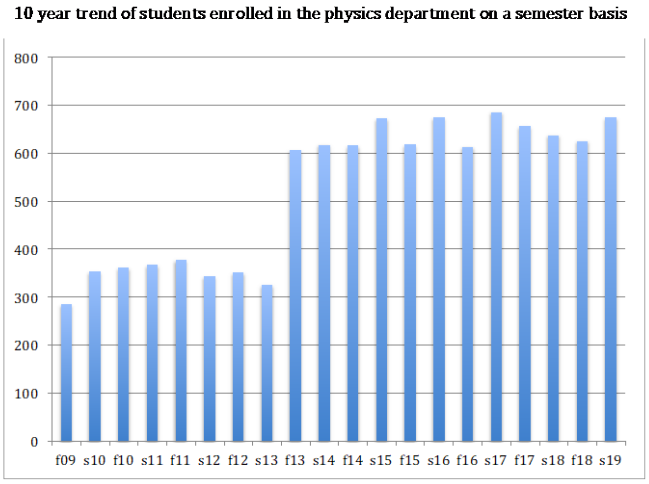
There is relevancy to both interest areas and guided pathways with regard to the retention data. Better retention means staying on track in their ed. plan and leaving the college in a timely manner. It is possible this issue may be addressed by students having a better understanding of the heavy workload/time commitment associated with STEM classes.

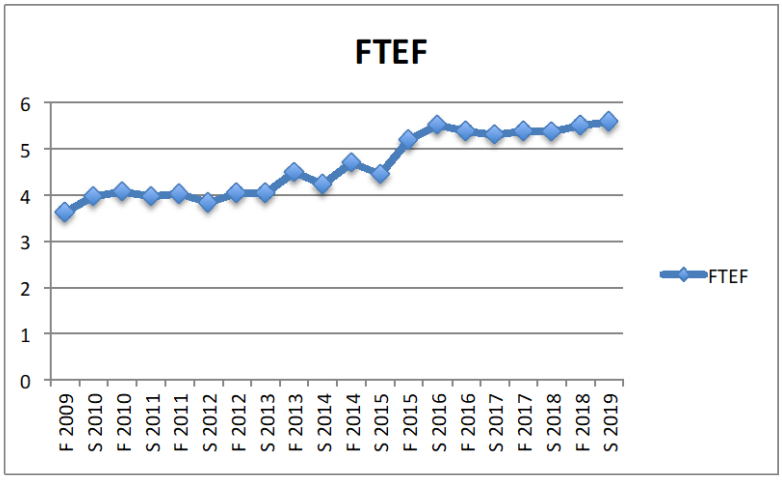
3b) Enrollment Trends: Assess and evaluate the three-year enrollment trends in your program's DSR data. In addition, analyze any relevant information found in the data dashboard related to these trends. Include an analysis of fill rates, wait lists, course cancellations, program completion, and classroom use. Address separately the data for on ground and online courses, as well as the data for the campus or centers at which you operate. Please describe any challenges experienced by the program. If you determine that you need to improve the program's performance in any way, please describe how you plan to achieve this goal.

In the past three academic years our enrollment trends have been extremely steady. The average enrollment per academic year for the past three years is; 362, 352, 353. Similarly the number of sections has remained at approximately 70 per academic year.

Steady enrollment is largely due to the fact that after an increase in adding sections and part time faculty (the Physics department was one of the few departments that grew during the years following the economic downturn) our growth has tapered off and become constant over the past five years or so. This is partially depicted in the graph below indicating the number of students enrolled[4] in a physics class per semester and the correlating FTEF graph below. The graphs indicate most of the physics departments growth occurred approximately between Fall 2013 to Spring 2016 (specifically consider the spring semester growth).

[4] This graph has isn't as representative as the FTEF for physics growth because enrollment is double counted in some of our classes as we switch from labs incorporated in the class to labs with their own CRN. A further analysis needs to be done to divide out the lab enrollment to see the overall trend. I predict it will mimic the FTEF graph.





Growth has been maximized **solely** due to space limitations in Sewell Hall. Our fill rates are consistently in the 90th percentile[5], and a very large majority of our sections are waitlisted. Please note that the data presented on the DSR is not representative of our waitlisted sections as is the case for all courses with associated labs that have different CRN's. [6] An example of the real status of percentage waitlist in the physics department is presented in a snapshot of the class schedule (which is added on to this report) and shows all physics classes on 1/21/2019 a week before the beginning of the semester. With that said if you realize that N/A is typically associated with a class that is waitlisted then of the 36 sections across all campuses only 3 are not waitlisted (2 with waitlists and 1 N/A associated with one of the waitlisted classes). This changes the % waitlisted calculation from 47% to the more accurate number of 89% sections waitlisted.[7] As a result we have not had to cancel any classes due to low enrollment and have only cancelled classes for deficiencies in staffing.

[5] With the exception of the NCC program which has grown steadily over the past three academic years finally reaching similar fill rates as compared to the Rocklin campus

[6] This issue is known to Erik Cooper as well as Randy Lehr and has to do with the way that our Physics labs have a CRN but are not waitlisted as they share the waitlist with the primary course.

[7] This assumes the % waitlist calculation does not take into account how many of the 20 spots are filled which would change the percentage.

The department's enrollment challenges are that it is poised to have significant growth (according to fill rates and waitlists) without the space to do so and waitlisted students are unable to get into classes. This dilemma really affects students and begets a culture of taking many students above cap in our department. This creates problems for already overloaded faculty members taking extra work. It should be noted even with taking on extra students we still turn away many students.

> As relevant, please address your program's role in the development of Interest Areas and Guided pathways and the impact of these developments on program planning and assessment.

Students who are waitlisted and cannot get in are then bottlenecked in the system ultimately compromising the guided pathways philosophy. We frequently turn away students who "desperately need" the class to transfer or to get out on time.

> 3c) Equity: Analyze and evaluate your program's performance in promoting and/or achieving equity. Based on this analysis, describe any plans you have to sustain or improve the program's contribution to student equity as a central component of student success.

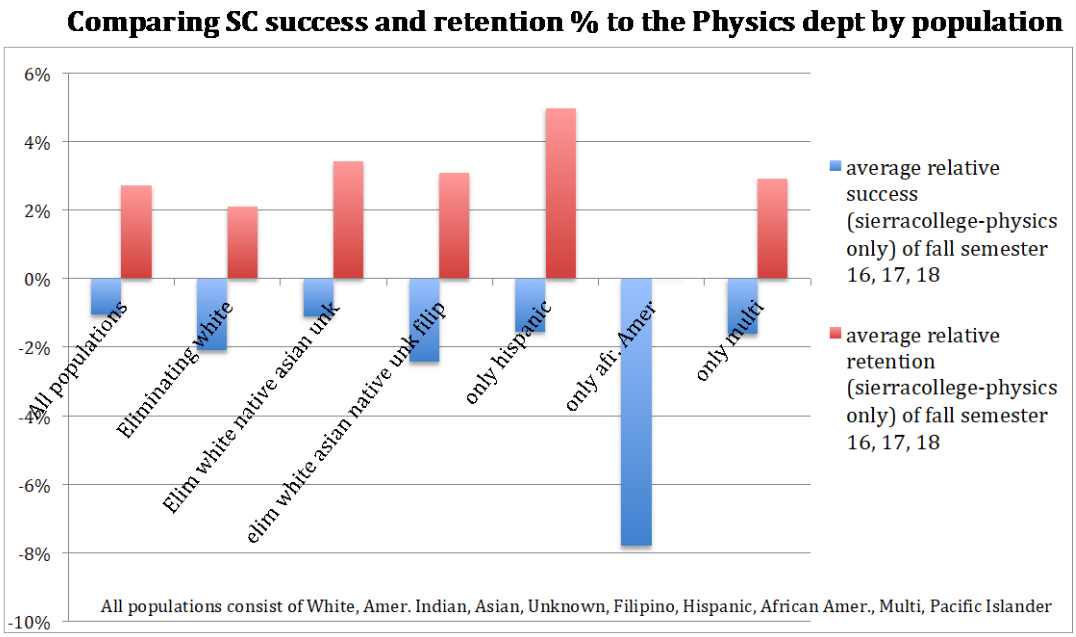
As outlined in 1b earlier the physics department attempts to create an inclusive and accessible environment for students with the aid of its many localized resources. In addition posters of physicists and scientists of historically underrepresented populations have been posted around the physics departments area in an attempt at inclusiveness of all populations.

As an initial performance analysis we compare and contrast the physics department to Sierra College via relative success and retention at the Rocklin and NCC campuses for the Fall 16, 17, and 18 semesters. This differs from the results in section 3a as it takes a look at different equity affected populations not just the student body as a whole.

Relative success and retention is first calculated for the entire population consisting of White, Native, Asian, Unknown, Filipino, Hispanic, African American, Multi, and Pacific Islander. Then for more refined populations; eliminating the White population from the total population, then eliminating White Native Asian and Unknown from the total population, then eliminating White Native Asian Unknown Filipino and Pacific Islander from the total population, eliminating all but Hispanic, eliminating all but African American[8] , and finally eliminating all but Multi.

When comparing *relative* success and retention data as indicated above certain trends were apparent; the physics departments success is overall better for all reduced populations as compared to the Sierra college whole and retention is overall lesser. *In the chart below negative values indicates a better result for the physics department comparatively higher than SC and positive indicates a lesser result.*

[8] It should be mentioned that African American students represent a very small percentage of the physics student and therefore the data set is too small to be statistically relevant on it's own.



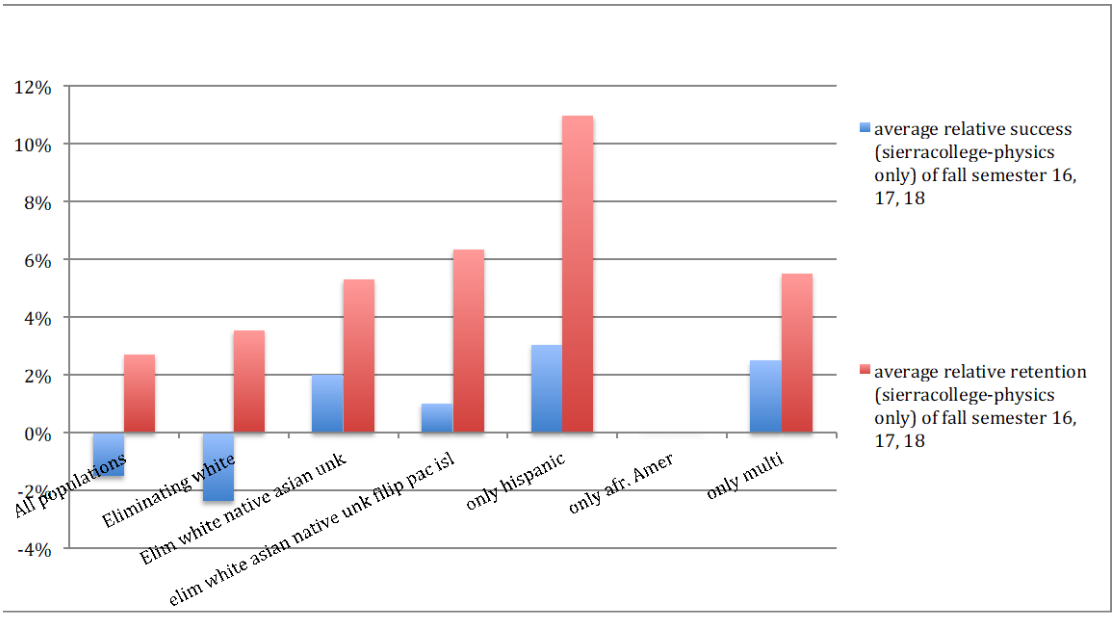
Example Calculation

(Sierra college success% F16)-(Physics success% F16) =74.13%-74.48%=-0.35%
Do this again for success in F17 and F18 to get -2.30% and -0.052%
Average the three numbers to get -1.06%
This is the first blue bar on the chart above for all populations

With the exception of retention, this data indicates a narrowing of the achievement gap as seen at Sierra College for typically at risk or historically under-represented students across the board. Overall this is a pleasing result and the success trend is across all populations. It should be mentioned that the Hispanic population retention is lower than average and bears investigation.

The next part of the analysis looks exclusively at the female population. It performs the same analysis as above after excluding all men from the data. The results are presented below:

Comparing SC success and retention % to the Physics dept by FEMALE population



All populations consist of White, Amer. Indian, Asian, Unknown, Filipino, Hispanic, African Amer., Multi, Pacific Islander

Comparing this graph to the previous graph for all male and female students it shows retention is similar or lower to the all gender study as you move across the different populations, and specifically Hispanic women seem to be at significant risk of poor retention in physics classes. Success also deviates from the first male/female study and as the population is reduced to only Hispanic, Filipino, Pacific Islander, African American, and Multi Ethnic populations (eliminating White, Native, Asian, and Unknown) that the success rate trend flips and instead of better success rates, we are now below the Sierra College average. This remains and increases after further reductions. [9]

This result indicates that we are somehow not serving Hispanic, Filipino, Pacific Islander, African American[10], and Multi-Ethnic female populations with equity.

To sustain and improve these findings we plan to survey the student body and obtain outside help from New Legacy committee. We will continue to evaluate the success and retention of all relevant populations in our classes and hopefully develop some new techniques to address at risk women populations in physics and Hispanic populations in physics.

3d) Optional information: Please describe and evaluate any additional relevant information supporting the evaluation of your program.

N/A

[9] After performing this analysis it is apparent that a deeper study needs to be done isolating each individual population. In the interest of time we present this limited finding. Similarly it should be noted that there is some significant variance in some of the the data presented that has not been recorded.

[10] There is not enough data to analyze the African American population on it's own.

3e) Analysis and Planning: Referring to the analysis in 3a-d, your ongoing planning and assessment documents, and any relevant information from section 2 above, please describe your program's plans to maintain or increase its effectiveness and analyze and evaluate your efforts to achieve these goals.

Maintaining the current physics program (size and curriculum) requires one additional full time faculty. This will help the department to maintain quality of load for the current full-time faculty and help to eliminate issues with finding qualified part time faculty. With a new full-time faculty will be able to keep up with the current workload associated with our program. We plan to go out for another faculty member again next year.

We will maintain the drop-in tutoring center in its current state (the S20 semester is the first time tutoring room has been a dedicated tutoring center without classes being held in it) keeping it healthy as it offers critical support for students, builds community, and provides an interest area-like environment. We anticipate increasing the amount of tutors and including more peer led groups for all of the classes (currently we have them for 105, 205, and A).

We plan to further analyze our retention rates and equity issues with regard to women in physics which are (sadly) consistent with many physics programs and try to discover colleges that have overcome these issues and adopt their practices when possible. We recognize there is higher risk in retention in the Hispanic student and will develop best practices to address this deficiency. We also plan to analyze and understand transfer rates amongst all classes and populations in an effort to provide equity and consistency in the transfer aspect of our service. In addition it is a goal of the department to analyze the growth that occurred between F13 and S16 in an attempt to understand the quality of the growth and how it has affected students in transfer and success.

In the future we do hope to grow as a department if possible within the current confines of space as long as quality of the program can be maintained. This lack of growth issue is perhaps the biggest obstacle in our student's path and we address it in section 4 with the request of a portable classroom dedicated to physics.

4) <u>Resources</u>: This category assesses the adequacy of current resources available to the program and describes and justifies the resources required to achieve planning goals by relating program needs to the assessments above.

4a) Please describe the future direction and goals of your program for the next three years in terms of sustaining or improving program effectiveness, relevance, and currency. Please include any relevant analysis of student success, equity goals, and the development of Interest Areas and Guided Pathways. Please incorporate analysis of any relevant outcome or other data in this description, including any data from the dashboard.

I apologize if I repeat some of my previous answers below, but I had a hard time distinguishing the difference between question 3e and 4a.

The future direction of the department is to *primarily* maintain the quality of education our students receive. We anticipate that in order to maintain department at its current level we will need a new full-time faculty.

We will continue to evaluate the success and retention of all relevant populations in our classes and hope to develop some new techniques to address at risk women populations in physics and Hispanic populations in physics. We will continue to evaluate student success in subsequent classes, and the effectiveness of our curriculum and develop new strategies for education based on those findings. As the ultimate student and program outcome we have expressed desire to find out the long-term success of our students after transfer and although the data is not currently available to perform that analysis we recognize that it would give us invaluable information into the success and structure of our program.

It is also the hope of the department to increase inter-departmental relationships and cohesiveness. This is already done in some part by our IA, Tyler Hickox who has developed strong relationships with the other IA's in Sewell Hall and has developed a community that resources skills and shares in what I believe is an idealized situation for the students and department. We would like to further that relationship amongst the out of department faculty and start to develop cohesiveness in certain educational goals; like the teaching of sig figs and other overlaps between departments where we should be consistent. It is also of utmost importance that we maintain collegiate cordiality amongst the current physics faculty and try to give a voice to our existing qualified part time faculty and meet their needs.

As a *secondary* goal the department hopes to expand. Although this is unlikely in the current spatially limited environment there is still the possibility if a new portable classroom was placed just outside the physics lab that serviced physics and engineering. If that was the case it would be possible with additional new faculty and IA's to alleviate the bottleneck of waitlisted classes mentioned in part 3. This should be done while maintaining quality of education. If possible (again unlikely with space limitations) physics department would like to participate in any plans for a larger inter-departmental stem tutoring center which would fit very nicely under the Interest Area umbrella.

4b) Please describe and justify any projected requests for additional staff, new or augmented technology/equipment, and additional or remodeled facilities necessary to support these goals. Please incorporate any relevant data related to SLOs, student success, and equity.

Equipment/Technology:

1. We have a few ongoing requests for new **laboratory equipment** and experiments related to the Hall effect and optics. These are in our ePar requests and are justified either by aging equipment or the natural evolution and development of educators in a physics laboratory where they desire to express the natural world to students in a hands on way.

Facilities:

1. The justification for new **portable classroom** has been outlined in questions 3b, 3e, and 4a. A brief summary of those finding is that we have highly impacted classes with heavy waitlists and students frequently find themselves unable to get into classes that they need to transfer and leave Sierra. It is a well-known issue that there is no space to grow in the sciences and this would help to alleviate part of that issue. The physics department has the need to remain close to its stockroom to teach, so it cannot utilize classrooms in other parts of the campus where enrollment is declining.

Staff:

1. Maintenance Position

As it stands in the department we are currently in need of a full time faculty position. After a period of growth as outlined in the FTEF graph in section 3b where FTEF increased from 3.63 to 5.58 over the course of 3 academic years we have struggled to maintain the quality of the department in the following ways:

a) We have problems maintaining a solid part time base. This has become more of a struggle with the aforementioned FTEF increase. This is a problem particular to many science departments since people with a masters or PhD can readily get employment for more money elsewhere. We have either had to further overload our existing FT employees or cut classes (S20 a full waitlisted course Phys 110 and 110L were cancelled for lack of staffing) to compensate for this.
b) FT faculty systematically take overloads since we exclusively have to teach the "harder" classes with more prep time and workload associated with them. Having a quality of overload environment would free time up for professional development, sabbatical, involvement with more committees, and allow us to easily take positions with release time in the college. As it stands, every time someone takes a position with release time the remaining FT faculty have to take even more overloads to compensate.
c) Something unique to the physics department is the open lab environment. Students drop in to the lab and faculty have lab hours where they help them. Many PT faculty teach lab classes in our department and are not as able to be as present and recognizable in the lab as our FT faculty. They also are not familiar with all of the labs being taught. With our increase in classes and corresponding increase in PT faculty the extra burden of dealing with extra lab students has almost exclusively fallen to existing FT faculty. Therefore, the quality/quantity of available help for students in the lab has decreased. A new FT member would help to remedy this issue.

2. Growth position

If growth becomes a possibility, we argue in order to grow and maintain the quality of the department we will need another FT faculty so that we do not recreate the conditions mentioned above where FT faculty are overloaded, overworked and do not have quality of load.

4e) Please check the appropriate boxes in the chart below indicating the general reasons for the resource requests described above (please check all that apply):

Function/Role	Maintenance	Development	Growth	Safety	Outcomes	Other success measures	No Requests
	X	X	X				

5) Summary/Closing

5a) Based on the analysis above, briefly summarize your program's strengths, weaknesses, opportunities/future directions, and challenges.

We are proud of our physics department as it is our belief that we have cultivated a quality learning environment for students. We hold the physics department is unique to Sierra College as we have been able to create a physics area that houses tutoring, faculty, IA, and open lab. This area allows for students to have an easy way to access help. All of this has been done while holding on to a large degree of rigor and quality. Our department is largely harmonious and this is reflected to the students and we coexist with the students as a functional family in community. We successfully transfer a large body of students and although it's anecdotal we frequently hear back from our students how well prepared they are upon transfer.

Our main weaknesses are culture of overloading FT faculty, our inability to grow, and deficiencies in certain equity populations. In the future we hope to remedy these issues by hiring FT faculty, finding a way to grow, and specifically addressing our at-risk populations through analysis and engagement of the student body.

5b) How has this report integrated the views and perspectives of stakeholders in the program?

This report was shared with all members of the Physics Department and with our Dean. Suggestions were incorporated where appropriate.