Academic Program Review (Astronomy/Physics) Latest Version

Academic Program Review: (1) Overview of the program First Submission: Version by **Schwitkis, Kent** on **12/05/2022 21:23**

Provide a brief narrative description of the current program, including the program's mission statement and the students it serves.
Compton College is a welcoming and inclusive community where diverse students are supported to pursue and attain student success. Compton College provides solutions to challenges, utilizes the latest techniques for preparing the workforce and provides clear pathways for completion of programs of study, transition to a university, and securing living-wage employment.

The mission of the Physics/Astronomy Department at Compton College is to prepare students with knowledge and skills to pursue further education in the physical, chemical, biological, and health sciences. Students learn to engage in scientific inquiry, problem solving, and are actively engaged in their learning and the community around them. An understanding of Physics is necessary for all those individuals interested in any other science. Truly, Physics is a Gateway Science.

Why Physics: From the American Association of Physics: "Not only is Physics crucial to understanding the world around us, the world inside us, and the world beyond us; it is the most basic and fundamental science. Physics challenges our imaginations with concepts like relativity and string theory, and it leads to great discoveries, like computers and lasers, that lead to technologies which change our lives—from healing joints, to curing cancer, to developing sustainable energy solutions... Physics encompasses the study of the universe from the largest galaxies to the smallest subatomic particles. Moreover, it is the basis of many other sciences, including chemistry, oceanography, seismology, and astronomy and can be applied to biology or medical science. "

Physics is ultimately about understanding nature, the world around us. Therefore, those that study physics become intimately aware about how to solve problems and test their solutions. So we've created a STEM Club, whose purpose is to allow our students experiences associated with hardware, software, and public speaking. Therefore, we have searched out for instructors and helpers that have industrial in addition to academic experiences. Finally, the STEM Club has opened its membership to Compton Alumni, which allows our alumni to help our current students with their education and career goals.

- We've launched two weather balloons (HAB) from campus, and retrieved them with 10 kilometers of their predicted landfall after a flight of 3 hours and 300 kilometers. One was launched in June 2018, and the second in June 2019. Due to Covid lockdowns, we were unable to launch in 2020 or 2021.
- We are working on a liquid-fueled rocket, called the Compton Comet, which will go into space.
- We frequently launch small rockets on campus (both solid fueled and water), as well as launching Alpha rockets with the Reaction Research Society at their Mojave Test Area. Alpha rockets are a solid-fueled ballistic arrow that goes a mile into the sky, and buries itself into the desert.
- We have run several programs associated, first remotely, and now in-person, that enable students to learn about mini-computers and controllers. They learn about hardware construction, and software implementation on Arduinos.
- We have run out-reach programs with high-school students.

As a result of our program, our STEM Club been invited to at

- Night Sky Festival in Joshua Tree National Park, where we've given talks and help with "Star Parties". We've done this twice, once in the Fall of 2021 and 2022.
- Griffith Observatories "All Space Considered" program, where we discussed the entire program (HAB), Compton Comet, Alphas, ... (Program was on 1 April 2022 - yes, April's Fools day)
- We been featured in the High Desert Post regarding the Compton Comet (31 July 2021). This article was reported to the campus at-large by Keith Curry in an email sent on 1 Aug 2021.
- The second HAB launch was televised on KCBS (video location https://www.youtube.com/watch?v=UA84P3mhEAg); 27 June 2019.
- Chapman University, where we discussed our first weather balloon launch and our Alpha launches - 7 Feb 2020
- We also participated in a High School Principles Breakfast on 10 October 2019

We are very happy with our graduates. Our anecdotal information is as follows...

Year	Transfer	Degree in Progress	Graduated STEM
2021-2022	6	6	0
2020-2021	20	13	0
2019-2020	29	13	2
2018-2019	22	6	9

Our biggest accomplishment are the 11 students who have graduated with STEM degrees, most are working in engineering, biology labs, or in the process of obtaining another degree.

Describe the degrees and/or certificates offered by the program.
The Compton College Physics Astronomy program offers courses that lead to Associate degrees in Physics and Astronomy or satisfy the general education requirements for transfer to four-year institutions for degrees in various programs.

At present, we offer three degrees: Associate of Science in Physics (A.S.), an Associate of Science in Physics for Transfer degree (AS-T), and an Associate of Science in Physical Science. All the courses offered at Compton College fulfill the general education requirements for physical science with a laboratory and are transferable to the University of California and California State University Systems.

Explain how the program fulfills the College's mission and aligns with the strategic initiatives.
Physicists are problem solvers. Their analytical skills make physicists versatile and adaptable so they work in interesting places. Now don't make the mistake that these skills are only associated with theory. They also incorporate the development of hardware and software. You can find physicists in industrial and government labs, on college campuses, in the astronaut corps, and consulting on TV shows. In addition, many physics grads work at newspapers and magazines, in government, and even on Wall Street—places where their ability to think analytically is a great asset. Of course, a degree in physics is not necessary to obtain these skills, but our courses, which are required for any science, do teach these problem-solving skills.

As a reminder, physics encompasses the study of the universe from the largest galaxies to the smallest subatomic particles. Moreover, it's the basis of many other sciences, including chemistry, oceanography, seismology, and astronomy (and can be applied to biology or medical science). All are easily accessible with a bachelor's degree in physics.

Physics brings a broad perspective to any problem. Because the problem-solving methodology is to learn how to consider any problem, so we are not bound by context. This inventive thinking makes the physics problem-solving methodology desirable in any field. A bachelor's degree in physics is a great foundation for careers in: Journalism, Law, Finance, Medicine, Engineering, Computer Science, Astronomy, and Biology.

Because of these problem-solving abilities, even when the job market is slow, physicists get job offers—well paying jobs. Employers know that a physicist brings additional skills with expertise and pay accordingly. That's why physics graduates can expect career salaries similar to those of computer science and engineering majors (see the link https://www.aps.org

/careers/statistics/index.cfm for more information, also https://www.careercornerstone.org/).

There are several ways where our program helps to improve recruitment, enrollment, retention, as well as completion rates for our students

- We have several instructors who have done research and have been in industry. Thereby, that have a wealth of experience that can be brought to bear for our students.
- Since the STEM Club has opened its membership to Compton Alumni, this allows our alumni to help our current students with their education and career goals.
- We are constantly improving the hardware and software that we have available for teaching, which also includes the building of rockets, high-altitude weather balloons, robotics, and the use of computers for control and simulation.
- We encourage our faculty to attend conferences associated with our various disciplines to maintain currency, for example, the Southern California chapter of the American Association of Physics Teachers (link https://physicsvideos.tripod.com/scaapt.html).
- We have participated and conducted in several summer offerings to our High School neighbors. The last one, in June of 2022, was conducted over two weeks and revolved around rockets and Arduinos.
- Because of the unfortunate impact of Covid, all of our classes have been modified so that they can be conducted in an asynchronous or synchronous manner. In fact, one of our instructors is quite involved in the certification process we have for instructors that wish to teach in the Distance Education program at Compton.

Discuss the status of recommendations from your previous program review.

Recommendations from the last Program Review

Item number	Recommendation text	Status
1	Hire a second physics/astronomy instructor	Before Covid and the separation from El Camino, we were growing a such a rate that would warrant such an investment.
2	Control the outdoor lighting	**Stuck**. This is still a very high priority. It was hoped that before Covid struck, that the 20 students in the STEM Club would be able to help in this regard.
3	Ladder to access upper cabinets safely	**unknown**
4	Obtain six (6) 6" Schmitt-Cassegrain GoTo telescopes and accessories	The costs have increased due to the Covid pandemic. Only 4 have been ordered. None of the accessories have been obtained yet.
5	Obtain four (4) Solar telescopes and accessories	The costs have increased due to the Covid pandemic, also the availability of these items have been limited. None have been ordered.
6	Obtain six (6) silicon PMT assemblies	This item has not progressed. It requires machine shop activities, and sufficient coordination has not been implemented.
7	Obtain hardware to launch 1 weather balloon per year	Support for this activity is on track.
8	Obtain another 20 laptops	The costs have increased due to the Covid pandemic. Only XX have been ordered.
9	Convert courses to allow Hybrid flexibility	Because of the Covid Pandemic, this activity has progressed for most of the class offerings in this department. Classes can be offered online or in-person.
10	Convert 4 semester Physics 1 sequence to 3 semesters	This item is almost completed at the time of this writing. We expect to implement this program in Fall 2023.
11	Equipment inventory maintenance	This item is not progressing.
12	Maintain, repair, and upgrade equipment	This item is not progressing.
13	Study whether to develop or purchase of a CLEA-like simulation software	This item has not started.
14	Have the tenured facility members attend SCAAPT and AAPT conferences, yearly if possible	Faculty members are notified of conferences and meetings, and the ability to get FLEX credit and "stipends".
15	Have the adjunct facility members attend SCAAPT and AAPT conferences, yearly if possible	Faculty members are notified of conferences and meetings, and the ability to get FLEX credit and "stipends".
16	Have the tenured facility members attend a meeting of the Astronomical Society of the Pacific or the American Astronomical Society	
17	Develop a community network that includes local high schools and 4-year colleges, and industry	Status unknown
18	Develop a formal connection with local industry, from informal existent one at present	Status unknown
19	Cross-coordination between Natural Science technicians and published schedule.	Status unknown

Academic Program Review: (2) Analysis of Research Data First Submission: Version by **Schwitkis, Kent** on **12/05/2022 21:24**

Head Count: Identify and explain trends in enrollment. Analyze enrollment demographic variables, including gender, ethnicity, age, educational goal and full-time/part-time status.

In regards to gender and ethnicity, our department's demographics match that for the overall college. These demographics are essentially independent of semester, since Fall 2017.

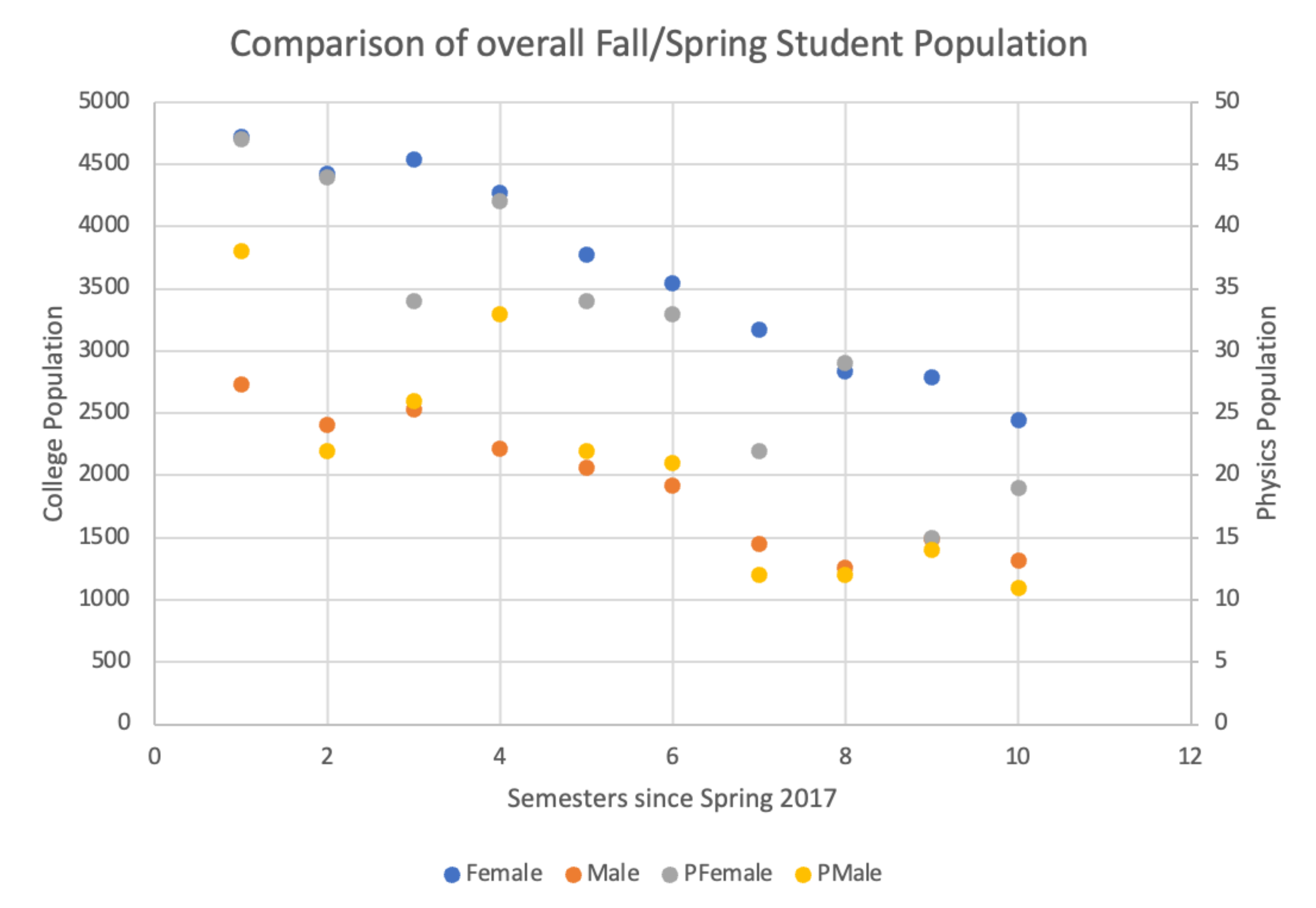
- Two-thirds of the population is Female
- Two-thirds of the population is Latinx
- 20% of the population is Black/African-American
- Average age is 24, but with a wide variation from 18 to 30.
- There reasons for taking our classes fall into 3 categories: enrichment, transfer, and those that are undecided. These categories changed during the time period. From Fall 2017 to Spring 2019, about 90% of the people fell into the transfer or undecided categories. After Fall 2019, nearly 70% of the response was for enrichment.

During the intersession, all of our students are part-time students, while during the Fall and Spring semesters the fraction of part-time students is about two-thirds.

As evidenced by the following chart, the enrollment has been dropping at the college. This is also evident in the numbers for the Astronomy/Physics department. The interesting thing is that the two rates are nearly identical. This is an indication that fraction of students in our department has remained the same. Interesting.

A couple of final comment about demographics.

- As the lead instructor for this department, it is my observation that we have 3 types of students. One can discern this by the types of courses the student takes. Typically the Astronomy 120, 125, 128, and most of the Physics 111 students are "just" fulfilling AA degree requirements. Those students in the Physics 120 and 122 classes are typically tying to get into Medical School. Finally, the Physics 150, 152, 250, and 252 students are going after Engineering degrees at a 4-year institution. It is my belief that the Physics 120/122 students have better work habits, as they know they are in a highly competitive environment.
- Secondly, nearly all of these students are doing "school" part time! That was never the case for the author.



Course Grade Distribution: Identify and explain trends in course grades. Make sure to address gaps in grade distribution if applicable.

As a reminder, there are 12 different courses in the Astronomy/Physics Department and we are also responsible for 2 Engineering courses

- Astronomy 120, 125, and 128
- Physics 111, 112, 120, 122, 150, 152, 250, and 252
- Engineering 101 and 109

Of the course

- The grade distribution for Astronomy 120 has been constant within the errors associated with the limited statistics. For example, during the time period from 2017 to 2022, the number of "A" earned was 41 +/- 5 %. The number of "W"s is about 20%.
- Astronomy 125 was not as stable. Before 2019-2020, the "A"s were at 40% while after it was at 70%. Given the numbers involved there is an error of 10% on these numbers. We also noticed at huge increase in the student population in 2019-2020. It was 10 times that just before or after.
- Physics 111 has the same trends as Astronomy 120. The grades were stable within the errors associated with the numbers. Again, there is a concern about the large number of "W"s.
- Physics 120 has been pretty stable as well during the time period. Again, the number of "W"s is of concern. They represent nearly 30% of the beginning population. Given the statistics though, this number could be 40% or 20%.
- Physics 122 has had such a low population that further analysis is un-warranted.
- Physics 150 has had a pretty stable grade distribution during this time period. Again, the number of "W"s is of concern (20%).
- Physics 152 was stable, but with nearly 75% being "A"s. "W"s were also nearly zero. As and Bs constitute nearly all of the grades reported.
- Physics 250 was stable. "W"s were nearly zero, and sort of like P152, As, Bs, and Cs constituted nearly 100% of the scores reported.
- Finally, there were too few students in Physics 252 to make a reasonable analysis.

Success Rates: Identify and explain trends in success rates. Make sure to address equity gaps in success rates if applicable.

There doesn't seem to be any difference in overall success or retention rates between the overall college and the Astronomy/Physics department. As evidenced in the chart below the success rate is in the high 60% range. The overall college rate is very similar. I suspect that the bumps in 2018-2019 and 2021-2022 have to do with the interest generated in the High Altitude Balloon and Make-It-Happen Projects.

Unique Students

Academic Year	
2017-18	12241
2018-19	11505
2019-20	8809
2020-21	6663
2021-22	6040
Grand Total	28984

Program: (All)
Academic Year: (All)
Course ID: (All)
Gender: (All)
Ethnicity: (All)
Age Group: (All)
Class Load: (All)
Education Goal: (All)

Overall Success Rate

Academic Year	
2017-18	68% (37904)
2018-19	69% (35027)
2019-20	64% (31251)
2020-21	70% (23744)
2021-22	68% (20906)
Grand Total	68% (148832)

Overall Retention Rate

Academic Year	
2017-18	83% (37904)
2018-19	83% (35027)
2019-20	79% (31251)
2020-21	84% (23744)
2021-22	84% (20906)
Grand Total	83% (148832)

Unique Students

Academic Year	
2017-18	571
2018-19	513
2019-20	444
2020-21	311
2021-22	227
Grand Total	1851

Program: Astronomy/Physics
Academic Year: (All)
Course ID: (All)
Gender: (All)
Ethnicity: (All)
Age Group: (All)
Class Load: (All)
Education Goal: (All)

Overall Success Rate

Academic Year	
2017-18	68% (672)
2018-19	70% (614)
2019-20	60% (529)
2020-21	64% (362)
2021-22	66% (250)
Grand Total	66% (2427)

Overall Retention Rate

Academic Year	
2017-18	79% (672)
2018-19	83% (614)
2019-20	79% (529)
2020-21	75% (362)
2021-22	83% (250)
Grand Total	80% (2427)

Retention Rates: Identify and explain trends in retention rates. Make sure to address equity gaps in retention rates if applicable.

There doesn't seem to be any difference in overall success or retention rates between the overall college and the Astronomy/Physics department. As evidenced in the chart below the retention rate is about 80% for the department. This is very similar to the overall college rate of 83%. I suspect that the bumps in 2018-2019 and 2021-2022 have to do with the interest generated in the High Altitude Balloon and Make-It-Happen Projects.

Program: (All) | Academic Year: (All) | Course ID: (All) | Gender: (All) | Ethnicity: (All) | Age Group: (All) | Class Load: (All) | Education Goal: (All)

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Grand Total	83% (148832)

Program: Astronomy/Physics | Academic Year: (All) | Course ID: (All) | Gender: (All) | Ethnicity: (All) | Age Group: (All) | Class Load: (All) | Education Goal: (All)

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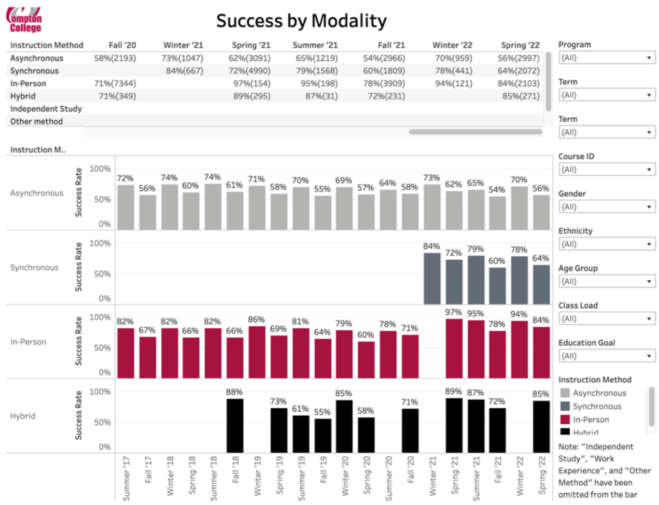
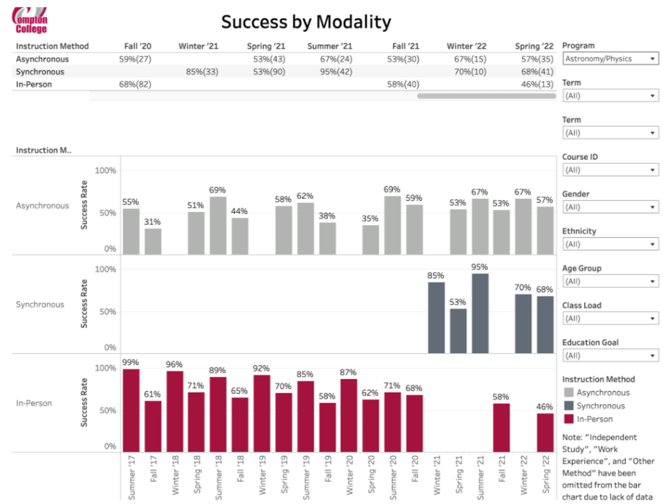
Grand Total	80% (2427)

Distance Education: Compare and contrast success and retention rates between in-person and distance education courses.

It should be pointed out that before the Covid Lockdown that we had only one online course. After the lockdown was lifted, the situation has reversed. The major trends we see below are probably due to the observation of specific details associated with specific classes.

- Asynchronous instruction
  - The overall school rate for asynchronous instruction seems to be falling from a rate of 72% before Covid to middle 50% after Covid. This is for intersessions. It seems that the rates are typically 15 percentage points lower during Fall and Spring.
  - The Astronomy/Physics department rates also show this difference between Fall/Spring semesters and the intersessions. Unlike the statistics for the overall college, the success rate seems to have improved after Covid.
- Synchronous instruction
  - Overall college rates seem to be decreasing from a high of 84% in Winter '21 to a low of 64% in Spring '22
  - The Astronomy/Physics department rates also show this decline, although the variations are larger. We started with a rate of 85% and have fallen to 68%.
- In-person instruction
  - Overall college rates were about 65% before Covid and jumped up to 85% after Covid during the Fall/Spring semesters. There was a increase of about 15 percentage points during the intersessions, before Covid. This increase has continued through Winter '21.
  - The Astronomy/Physics department rates show similar trends with larger variations.
    - Spring seems to be better than Fall.
    - Intersessions are typically about 90% or better.
    - The Fall '21 and Spring '22 show marked drops in success.



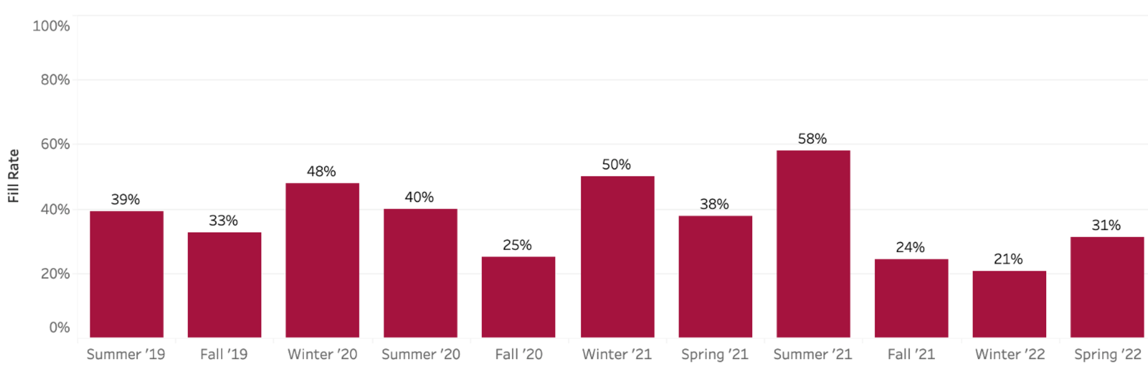


Fill Rates: Discuss course sections offered and fill rates. Analyze any applicable trends.
As indicated in the charts below, the fill rate for the Astronomy/Physics department is about 40%. High fill rates occur when we have few courses being offered. It is sad state of affairs that we have lower fill rates when we have a standard offering of courses during Fall and Spring semesters.

Fill Rates

Course Id	Summer '19	Fall '19	Winter '20	Summer '20	Fall '20	Winter '21	Spring '21	Summer '21	Fall '21	Winter '22	Spring '22
ASTR-120	67% (49)	51% (44)	23% (7)	60% (44)	23% (20)	67% (20)	47% (45)	73% (48)	31% (22)	19% (7)	43% (26)
ASTR-125		38% (57)			50% (13)		50% (13)		23% (8)		23% (7)
ASTR-128		42% (11)			12% (<5)		9% (<5)				7% (<5)
ENGR-101	11% (<5)	17% (6)		11% (<5)	17% (6)		11% (<5)		11% (<5)		
ENGR-109		17% (6)			14% (5)						
PHYS-111		20% (14)			14% (5)		34% (12)		23% (7)	40% (12)	37% (11)
PHYS-120	23% (7)	20% (7)	40% (12)		23% (7)	33% (10)	34% (12)	31% (11)	23% (8)	3% (<5)	58% (11)
PHYS-122	20% (6)	17% (6)		27% (8)							13% (<5)
PHYS-150		42% (11)			57% (17)		37% (13)		33% (<5)		32% (6)
PHYS-152		37% (11)	80% (24)		27% (8)						
PHYS-250							46% (30)				42% (8)
PSCI-125				37% (11)			51% (18)				27% (8)

Prog: Astronomy/Physics
Term: (All)
Course Id: (All)
Instructor Name: (All)
GPD: (All)



Course Scheduling: Discuss the days and times offered for courses. Why were these choices made? Should changes be made for future scheduling?
Current scheduling is conducted according to the following constraints

- We want to maximize our fill rate, even though there are few engineering or physics student at Compton, YET.
    - In turn, this means we offer 1, 2, or 3 sections of Astronomy 120 per semester. One section is asynchronous online.
    - One section of Astronomy 125.
    - One or two sections of Physics 111, if one section is asynchronous online.
    - We are finding that the asynchronous online classes fill.
    - Unfortunately, our Physics 120/122 and Physics 150/152/250/252 classes are being hurt because our abysmal fill rate. We can only offer one section of Physics 120 and Physics 150 per semester. This is actually an increase in offering per year. Physics 122, 152, 250, and 252 are offered only once per year.
        - We were some success before the Compton/El Camino separation, and the Covid lock down. The effect of our high-altitude weather balloon project was being felt.
        - We are also seeing the effect of the Make-It-Happen projects as well.
- We want to minimize conflicts with the Math department

Degree and Transfer: What number of students earn degrees or certificates? What number of students transfer?
The Astronomy/Physics department plays a role in the four degrees as indicated below. The information on Transfers is indicated in the "Transfer Studies" line item.

The data in the chart below incorporates a portion of the time when we were still part of El Camino. This Program Review is suppose to cover the time period from 2018-2019 on. If we concentrate on these two sets of columns, then we do see a decrease in the General Studies, General Science, and Physics degrees, and an increase in the Physical Science degree.

	2015-16			2016-17		2017-18		2018-19	2019-20			Grand Total
	ADTs	Certific..	Degrees	ADTs	Degrees	ADTs	Degrees	Degrees	ADTs	Certific..	Degrees	
General Science	< 5		32	< 5	41		71	94			62	302
General Studies	11	< 5	137	10	143	21	215	226			157	921
Physical Science			< 5		< 5		< 5	15			18	42
Physics	< 5					< 5		12	7			25
Transfer Studies										9		9

Our anecdotal information is as follows...

Year	Transfer	Degree in Progress	Graduated STEM
2021-2022	6	6	0
2020-2021	20	13	0
2019-2020	29	13	2
2018-2019	22	6	9

Our biggest accomplishment are the 11 students who have graduated with STEM degrees, most are working in engineering, biology labs, or in the process of obtaining another degree.

List any related recommendations

1. Determine why there is a 20% "W" rate in Astronomy 120, Physics 111, Physics 120, Physics 150.
2. Increase the awareness of our program on-campus and off.
3. Increase the awareness of those students that are in the Astronomy/Physics department that graduate with AA and AT degrees, and that Transfer.

Academic Program Review: (3) Curriculum First Submission: Version by **Schwitkis, Kent** on **12/05/2022 21:24**

Provide the curriculum course review timeline to ensure all courses are reviewed at least once every 6 years.
The Astronomy program of the Department offers five courses: Astronomy 120, 120H, 125, 125H, and 128. As indicated in the table below, all have been reviewed in the past couple of years and are not due for a while.

The same is true for the Physics portion of the program, although we have added 3 new classes. This brings the number of physics classes to ten: Physics 101, 102, 103, 111, 120, 122, 150, 152, 250, 252, and 99. These courses were either reviewed in 2020 or 2022 and are not due until 2025 or 2027, just like those in Astronomy. **Physics 112**

We have a course called Physical Science, which is for those individuals that wish to teach at the elementary and middle school level. This is a physics course and was reviewed in 2020 and will be reviewed again in 2025.

Course	Compton Course #	Course Title	Date Last Reviewed	Next Review Semester Due
ASTR	120	The Solar System	6/27/2022	Spring 2027
ASTR	120H	Honors The Solar System	3/21/2022	Spring 2027
ASTR	125	Stars and Galaxies	3/21/2022	Spring 2027
ASTR	125H	Honors Stars and Galaxies	5/16/2022	Spring 2027
ASTR	128	Astronomy Laboratory	10/20/2020	Fall 2025
PHYS	101	Physics for Engineers and Scientists I	New 3/21/2022	Spring 2027
PHYS	102	Physics for Engineers and Scientists II	New 3/21/2022	Spring 2027
PHYS	103	Physics for Engineers and Scientists III	New 4/18/2022	Spring 2027
PHYS	111	Descriptive Introduction to Physics	5/16/2022	Spring 2027
PHYS	112	Laboratory for Introductory Physics		
PHYS	120	General Physics	11/17/2020	Fall 2025
PHYS	122	General Physics	10/20/2020	Fall 2025
PHYS	150	Mechanics of Solids	11/17/2020	Fall 2025
PHYS	152	Fluids, Heat and Sound	12/8/2020	Fall 2025
PHYS	250	Electricity and Magnetism	11/17/2020	Fall 2025
PHYS	252	Optics and Modern Physics	12/8/2020	Fall 2025
PHYS	99	Independent Study	6/27/2022	Spring 2027
PSCI	125	Exploring Physical Sciences	11/17/2020	Fall 2025

Explain any course additions to current course offerings.
The 3-semester calculus-based physics sequence will be started in Fall 2023. This series of courses is more like those at other community colleges as well as those offered at our 4-year institutions. The 4-semester sequence is the methodology instituted by El Camino College, which we used while a part of their system. That series of courses is continued to be used at Compton College. The hope is that we'll be able to recruit students from other college areas with our better program, either with the 3-semester or the 4-semester sequence.

Explain any course deletions and inactivations from current course offerings.
There have been no course deletions or inactivations at the present time.

Describe the courses and number of sections offered in distance education. (Distance education includes hybrid classes.)
Because of the Covid pandemic, all courses have been modified to enable the distance education modality, either by synchronous or asynchronous means.
Physics 111 and Astronomy 120 have been consistently offered in an Asynchronous Modality. There has been typically one section offered per semester.

Discuss how well the courses, degrees, or certificates meet students' transfer or career training needs.

These courses meet the students transfer needs as they are certified by the UC and CSU systems.

How many students earn degrees and/or certificates in your program? Set an attainable, measurable goal related to student completion of the program's degrees/certificates.
Most of our students do not obtain the Physics AT degree, although they all transfer.

Are any licensure/certification exams required for program completion or career entry? If so, what is the pass rate among graduates? Set an attainable, measurable goal for pass rates and identify any applicable performance benchmarks set by regulatory agencies.
There are no licensure or certification exams as part of this program.

List any related recommendations.
Create or find OER materials for

- Physics 111 and 112
- Lab manuals for Physics 101, 102, 103, 150, 152, 250, 252

Academic Program Review: (4) Assessment of Student Learning Outcomes (SLO's) First Submission: Version by **Schwitkis, Kent** on **12/05/2022 21:24**

Provide a copy of your alignment grid, which shows how course, program, and institutional learning outcomes are aligned.
The overall alignment grid for the Department's Learning Outcomes to those of the Institution are

DIVISION 1
Institutional (ILO), Program (PLO), and Course (SLO) Alignment

Program: **Astronomy & Physics**	Number of Courses: 10	Date Updated: 10.23.2015	Submitted by: K. Radcliff, ext. 2212 K. Schwitkis, ext. 2428

ILOs	1. Critical Thinking	2. Communication	3. Community and Personal Development	4. Information Literacy
	Students apply critical, creative and analytical skills to identify and solve problems, analyze information, synthesize and evaluate ideas, and transform existing ideas into new forms.	*Students effectively communicate with and respond to varied audiences in written, spoken or signed, and artistic forms.*	*Students are productive and engaged members of society, demonstrating personal responsibility, and community and social awareness through their engagement in campus programs and services.*	*Students determine an information need and use various media and formats to develop a research strategy and locate, evaluate, document, and use information to accomplish a specific purpose. Students demonstrate an understanding of the legal, social, and ethical aspects related to information use.*

SLO-PLO-ILO ALIGNMENT NOTES:

Mark boxes with an 'X' if: SLO/PLO is a major focus or an important part of the course/program; direct instruction or some direct instruction is provided; students are evaluated multiple times (and possibly in various ways) throughout the course or are evaluated on the concepts once or twice within the course.

DO NOT mark with an 'X' if: SLO/PLO is a minor focus of the course/program and some instruction is given in the area but students are not formally evaluated on the concepts; or if the SLO/PLO is minimally or not at all part of the course/program.

PLOs	**PLO to ILO Alignment** *(Mark with an X)*			
	1	**2**	**3**	**4**
PLO #1 Applying Relevant Principles Students will trace the development of a scientific idea from gathering of data through development of a hypothesis to testing a prediction.	X			
PLO #2 Solving Physics Problems Students will make scientific measurements and demonstrate the difference between disagreement and error.	X			
PLO #3 Data Collection & Analysis Students will read a simple graph or diagram and interpret the results appropriately.	X	X		

The alignments for the Astronomy and Introductory Physics SLOs to the PLOs and ILOs are as follows. Please note that the course numbers have been changed

1. ASTR 12 is ASTR 128
2. ASTR 20 is ASTR 120
3. ASTR 25 is ASTR 125
4. PHYS 11 is PHYS 111
5. PHYS 12 is PHYS 112

SLOs	SLO to PLO Alignment *(Mark with an X)*			COURSE to ILO Alignment *(Mark with an X)*			
	P1	P2	P3	1	2	3	4
ASTR 12 Astronomy Laboratory: SLO #1 Scientific Method Students will be able to apply the Scientific Method to the solution of astronomical problems.	X	X	X	X			
ASTR 12 Astronomy Laboratory: SLO #2 Locating Celestial Objects Using a Cassegrain reflecting telescope, students will be able to align the telescope and point it at several objects, including the Moon, planets visible to the naked eye, planets invisible to the naked eye, bright stars, faint stars, and diffuse objects (clusters, nebulae, and galaxies).	X	X	X	X			
ASTR 20 The Solar System: SLO #1 Scientific Method Students will be able to recognize the elements of the Scientific Method in the discussion of a scientific problem.	X	X					
ASTR 20 The Solar System: SLO #2 Seasons Students will be able to explain the causes of seasonal variations in the length of the day, direction of sunrise and sunset, and the amount of solar heating on the Earth.	X	X		X			
ASTR 20 The Solar System: SLO #3 Planet Origins Students will be able to describe the modern theory of the origin of the planets and discuss the evidence that supports the theory.	X	X					
ASTR 25 Stars and Galaxies: SLO #1 Scientific Method Students will be able to recognize the elements of the Scientific Method in the discussion of a scientific problem.	X	X					
ASTR 25 Stars and Galaxies: SLO #2 Radiation Students will explain how electromagnetic radiation and astronomical instruments are used to reveal the properties of stars and planets.	X	X		X			
ASTR 25 Stars and Galaxies: SLO #3 Universe Origin Students will be able to describe the modern theory of the origin of the universe (the Big Bang Theory) and discuss the evidence that supports the theory.	X	X					
PHYS 11 Descriptive Introduction to Physics: SLO #1 Applying Relevant Principles Given a description of a physical situation (floating ice cube, falling body,...) the student should be able to recognize the basic physical principles involved in order to correctly answer conceptual questions.	X			X			
PHYS 12 Laboratory for Introductory Physics: SLO #1 Data Collection & Analysis Students can read and record, with appropriate units and uncertainties, measurements taken from a ruler a vernier and a protractor. Students can interpret and analyze that data, including error analysis.	X		X	X	X		

The following chart shows the alignment for the Calculus-based and Algebra-based Physics Courses between the SLOs, PLOs, and ILOs. Note that the naming convention has changed.

1. PHYS 1A is PHYS 150
2. PHYS 1B is PHYS 152
3. PHYS 1C is PHYS 250
4. PHYS 1D is PHYS 252
5. PHYS 2A is PHYS 120
6. PHYS 2B is PHYS 122

SLOs	SLO to PLO Alignment *(Mark with an X)*			COURSE to ILO Alignment *(Mark with an X)*			
	P1	P2	P3	1	2	3	4
PHYS 1A Mechanics of Solids: SLO #1 Applying Relevant Principles Students can recognize the basic physical principles which are relevant in a given physical situation involving mechanics in order to correctly answer conceptual questions.	X						
PHYS 1A Mechanics of Solids: SLO #2 Solving Physics Problems Students can identify and apply the relevant laws of physics along with the necessary mathematics to successfully solve a mechanics problem.		X		X			
PHYS 1A Mechanics of Solids: SLO #3 Data Collection & Analysis Students can read and record, with appropriate units and uncertainties, measurements taken from a Vernier caliper and a micrometer caliper. Students can interpret and analyze the collected data, including error analysis.			X				
PHYS 1B Fluids, Heat and Sound: SLO #1 Applying Relevant Principles Students can recognize the basic physical principles which are relevant in a given physical situation involving heat, fluids or sound in order to correctly answer conceptual questions.	X						
PHYS 1B Fluids, Heat and Sound: SLO #2 Solving Physics Problems Students can identify and apply the laws of physics along with the necessary mathematics to successfully solve a problem dealing with heat, fluids or sound.		X		X			
PHYS 1B Fluids, Heat and Sound: SLO #3 Data Collection & Analysis Students can read and record, with appropriate units and uncertainties, measurements taken from an instrument used to measure temperatures, densities or pressures. Students can interpret and analyze that data, including error analysis.			X				
PHYS 1C Electricity and Magnetism: SLO #1 Applying Relevant Principles Students can recognize the basic physical principles which are relevant in a given physical situation involving electricity, magnetism or electromagnetism in order to correctly answer conceptual questions.	X						
PHYS 1C Electricity and Magnetism: SLO #2 Solving Physics Problems Students can identify and apply the relevant laws of physics along with the necessary mathematics to successfully solve a problem dealing with electricity, magnetism or electromagnetism.		X		X			
PHYS 1C Electricity and Magnetism: SLO #3 Data Collection & Analysis Students can read and record, with appropriate units and uncertainties, measurements taken from a multimeter and a voltmeter. Students can interpret and analyze that data, including error analysis.			X				

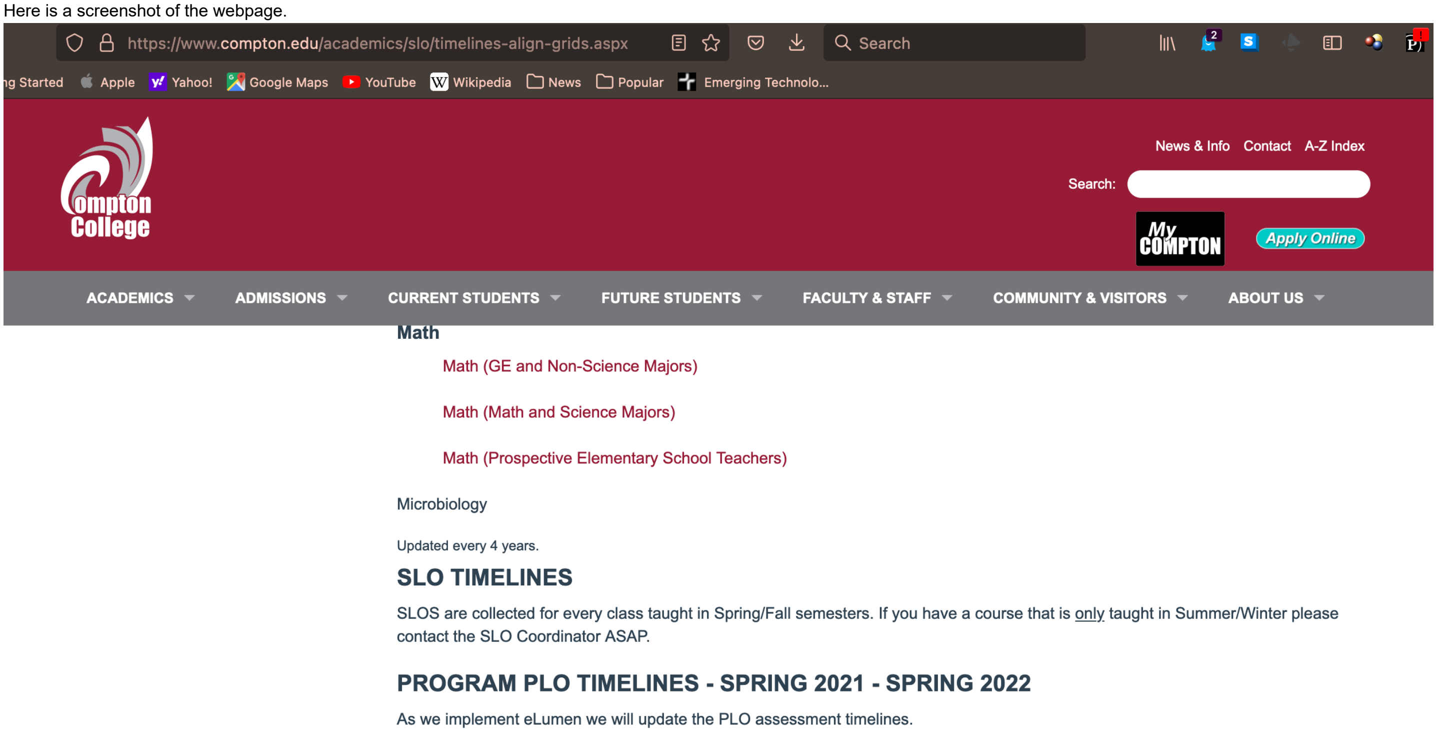
SLOs	SLO to PLO Alignment (Mark with an X)			COURSE to ILO Alignment (Mark with an X)			
	P1	P2	P3	1	2	3	4
PHYS 1D Optics and Modern Physics: SLO #1 Applying Relevant Principles Students can recognize the basic physical principles which are relevant in a given physical situation involving electricity, magnetism or electromagnetism in order to correctly answer conceptual questions.	X						
PHYS 1D Optics and Modern Physics: SLO #2 Solving Physics Problems Students can identify and apply the relevant laws of physics along with the necessary mathematics to successfully solve a problem dealing with electricity, magnetism or electromagnetism.		X		X			
PHYS 1D Optics and Modern Physics: SLO #3 Data Collection & Analysis Students can read and record, with appropriate units and uncertainties, measurements taken from a multimeter and a voltmeter. Students can interpret and analyze that data, including error analysis.			X				
PHYS 2A General Physics: SLO #1 Applying Relevant Principles Students can identify the physical principles which are relevant in a given physical situation involving mechanics, heat, fluids or sound in order to correctly answer conceptual questions.	X						
PHYS 2A General Physics: SLO #2 Solving Physics Problems Students can identify and apply the relevant laws of physics along with the necessary mathematics to successfully solve a mechanics problem.		X		X			
PHYS 2A General Physics: SLO #3 Data Collection & Analysis Students demonstrate ability to correctly read and record, with appropriate units and uncertainties, measurements taken from a vernier caliper and a micrometer caliper. Students can interpret and analyze the collected data, including error analysis.			X				
PHYS 2B General Physics: SLO #1 Applying Relevant Principles Students can identify the physical principles which are relevant in a given physical situation involving electricity, magnetism, electromagnetism, optics or modern physics in order to correctly answer conceptual questions.	X						
PHYS 2B General Physics: SLO #2 Solving Physics Problems Students can identify and apply the relevant laws of physics along with the necessary mathematics to successfully solve a problem dealing with electricity, magnetism, electromagnetism, optics or modern physics.		X		X			
PHYS 2B General Physics: SLO #3 Data Collection & Analysis Students can read and record, with appropriate units and uncertainties, measurements taken from a multimeter. Students can interpret and analyze that data, including error analysis.			X				

Provide a timeline for your course and program level SLO assessments.

I'm surprised that the timelines are not available. The Compton website page displaying the various grids and timelines has the following statements

- SLO TIMELINES
  - SLOS are collected for every class taught in Spring/Fall semesters. If you have a course that is only taught in Summer/Winter please contact the SLO Coordinator ASAP.
- **Program PLO Timelines - Spring 2021 - Spring 2022**
  - As we implement eLumen we will update the PLO assessment timelines.

Here is a screenshot of the webpage.



The latest worksheet that this author has on this subject from 31 July 2017 and 10 Jun 2020 shows

Course and SLO #		FA 2018	SP 2019	SU 2019	FA 2019	SP 2020	SU 2020	FA 2020	SP 2021	SU 2021	FA 2021
PHYS 11 - SLO #1	P11 = P111	X			X			X	X		
PHYS 12 - SLO #1	P12 = P112	X			X			X			x
PHYS 1A - SLO #1	P1A = P150	X			X			X			x
PHYS 1A - SLO #2		X			X			X			x
PHYS 1A - SLO #3		X			X			X			x
PHYS 1B - SLO #1	P1B = P152	X			X			X			x
PHYS 1B - SLO #2		X			X			X			x
PHYS 1B - SLO #3		X			X			X			x
PHYS 1C - SLO #1	P1C = P250		x			x			X		
PHYS 1C - SLO #2			x			x			X		
PHYS 1C - SLO #3			x			x			X		
ASTR 12 - SLO #1	A12 = A128	x			x			x	x		
ASTR 12 - SLO #2		x			x			x			x
ASTR 20 - SLO #1	A20 = A120	x			x			x	x		
ASTR 20 - SLO #2		x			x			x		x	
ASTR 20 - SLO #3		x			x			x			x
ASTR 25 - SLO #1	A25 = A125	x			x			x	x		
ASTR 25 - SLO #2		x			x			x		x	
ASTR 25 - SLO #3		x			x			x			x

It should be noted that not all SLOs were tested in this time frame. The reason is that some classes are not offered, or are not offered regularly. An example is Physics 250 (AKA Physics 1D).

State the percent of course and program SLO statements that have been assessed.

- In Fall 2021
  - Astronomy 120 had 3 SLOs, all were tested
  - Physics 111 had 1 SLO, it was tested
  - Physics 120 had 3 SLOs, all were tested
  - Physics 150 had 3 SLOs, all were tested
- In Spring 2021
  - Astronomy 120 had 3 SLOs, all were tested
  - Physics 111 had 1 SLO, it was tested
  - Physics 120 had 3, all were tested
  - Physics 150 had 3, all were tested
  - Physics 250 had 3, all were tested
- In Spring 2022 - All SLOs were completed
  - Astronomy 120 had 3, all were tested
  - Physics 111 had 1, all were tested
  - Physics 120 had 3, all were tested
  - Physics 150 had 3, all were tested
  - Physics 250 had 3, all were tested

I'm surprised that Astronomy 125 has not been assessed. I'm not surprised about Astronomy 128, Physics 112, Physics 122, or Physics 252 not having assessments performed in this time period, as none of these classes have been offered, or are not offered during Fall or Spring, or have been only once.

Summarize the SLO and PLO assessment results over the past four years and describe how an analysis of those results led to improved student learning. Analyze and describe those changes. Provide specific examples.

We only have access to results for 3 semesters (Spring 21, Fall 21, and Spring 21). Somehow the previous years assessments are not available. Also, the performance measure of 70% was not created by us.

For Astronomy 120, the results as indicated in the chart below, show that our SLOs are met.

SLO	Default Performance Measure	Spring 21			Fall 21			Spring 22		
		Meets expectations	Does not meet expectations	N/A	Meets expectations	Does not meet expectations	N/A	Meets expectations	Does not meet expectations	N/A
SLO #1 - recognize the elements of the Scientific Method in the discussion of a scientific problem.	70.0%	93.33% 90.48%	6.67% 9.52%	13	88.89% 91.30%	11.11% 8.70%	0	88.89% 80.95%	11.11% 19.05%	6
SLO #2 - explain the causes of seasonal variations in the length of the day, direction of sunrise and sunset, and the amount of solar heating on the Earth.	70.0%	93.33% 80.95%	6.67% 19.05%	13	72.22% 69.57%	27.78% 30.43%	0	83.33% 71.43%	16.67% 28.57%	6
SLO #3 - describe the modern theory of the origin of the planets and discuss the evidence that supports the theory.	70.0%	93.33% 71.43%	6.67% 28.57%	13	61.11% 65.22%	38.89% 34.78%	0	77.78% 66.67%	22.22% 33.33%	6

For Physics 111, we have access to results for only the Fall 21 semester. In that case, our results were 71% of the students met the expectation of 70%.

For Physics 120, we have data for three semesters (Spring 21, Fall 21, and Spring 22)

SLO	Default Performance Measure	Spring 21			Fall 21			Spring 22		
		Meets expectations	Does not meet expectations	N/A	Meets expectations	Does not meet expectations	N/A	Meets expectations	Does not meet expectations	N/A
SLO #1 - Students can identify the physical principles which are relevant in a given physical situation involving mechanics, heat, fluids or sound in order to correctly answer conceptual questions.	70.0%	75% 75%	25% 25%	12	87.5% 87.5%	12.5% 12.5%	0	100% 100%	0% 0%	5
SLO #2 - Students can identify and apply the relevant laws of physics along with the necessary mathematics to successfully solve a problem.	70.0%	50% 50%	50% 50%	12	50% 50%	50% 50%	0	75% 75%	25% 25%	5
SLO #3 - Students demonstrate ability to correctly read and record, with appropriate units and uncertainties, measurements taken from a vernier caliper and a micrometer caliper. Students can interpret and analyze the collected data, including error analysis.	70.0%	75% 75%	25% 25%	12	50% 50%	50% 50%	0	50% 50%	50% 50%	5

For Physics 150, we have data for three semesters (Spring 21, Fall 21, and Spring 22)

SLO	Default Performance Measure	Spring 21			Fall 21			Spring 22		
		Meets expectations	Does not meet expectations	N/A	Meets expectations	Does not meet expectations	N/A	Meets expectations	Does not meet expectations	N/A
SLO #1 - Students can recognize the basic physical principles which are relevant in a given physical situation involving mechanics in order to correctly answer conceptual questions.	70.0%	70% 70%	30% 30%	3	75% 75%	25% 25%	0	83.33% 83.33%	16.67% 16.67%	0
SLO #2 - Students can identify and apply the relevant laws of physics along with the necessary mathematics to successfully solve a mechanics problem.	70.0%	50% 50%	50% 50%	3	100% 100%	0% 0%	0	50% 50%	50% 50%	0
SLO #3 - Students can read and record, with appropriate units and uncertainties, measurements taken from a Vernier caliper and a micrometer caliper. Students can interpret and analyze the collected data, including error analysis.	70.0%	20% 20%	80% 80%	3	75% 75%	25% 25%	0	83.33% 83.33%	16.67% 16.67%	0

For Physics 250, we have data for two semesters (Spring 21 and Spring 22)

SLO	Default Performance Measure	Spring 21			Spring 22		
		Meets expectations	Does not meet expectations	N/A	Meets expectations	Does not meet expectations	N/A
SLO #1 - Students can recognize the basic physical principles which are relevant in a given physical situation involving electricity, magnetism or electromagnetism in order to correctly answer conceptual questions.	70.0%	88.89% 88.89%	11.11% 11.11%	2	85.71% 85.71%	14.29% 14.29%	1
SLO #2 - Students can identify and apply the relevant laws of physics along with the necessary mathematics to successfully solve a problem dealing with electricity, magnetism or electromagnetism.	70.0%	66.67% 66.67%	33.33% 33.33%	2	85.71% 85.71%	14.29% 14.29%	1
SLO #3 - Students can read and record, with appropriate units and uncertainties, measurements taken from a multimeter and a voltmeter. Students can interpret and analyze that data, including error analysis.	70.0%	33.33% 33.33%	66.67% 66.67%	2	42.86% 42.86%	57.14% 57.14%	1

Describe how you have improved your SLO/PLO assessment process and engaged in dialogue about assessment results.
Our assessment processes are changing. Prior to the Covid lock-down, we had a set of standard SLO quizzes for each SLO. Some required the use of physical hardware which became unavailable for testing (or teaching) purposes. We now have assessments that can be used to test student lab abilities, so we can roll these out to all of our instructors. We also need to get back to our standard testing vehicles.

List any related recommendations.

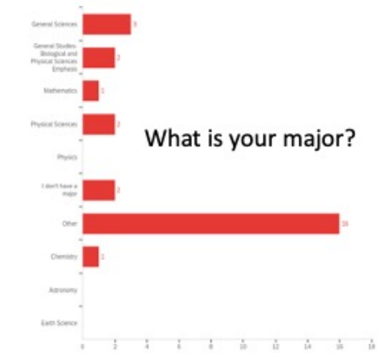
- Review the standard test vehicles for testing Conceptual and Problem-solving SLOs. Modify and distribute the new test vehicles.
- Provide the "new" lab assessments to the faculty and discuss and validate their use in the future.
- Specify our own performance measure dependent upon class type.

Academic Program Review: (5) Analysis of Student Feedback First Submission: Version by **Schwitkis, Kent** on **12/05/2022 21:24**

Describe the results of the student survey in the area of student support.
The survey indicated in this section of the program review was provided to the students involved in the department's classes during Fall 2021. There were 27 respondents. We also conducted a survey in 2018, which is provided in the "other" relevant surveys section below. There is a lot of similarities between the two surveys. The current survey shows

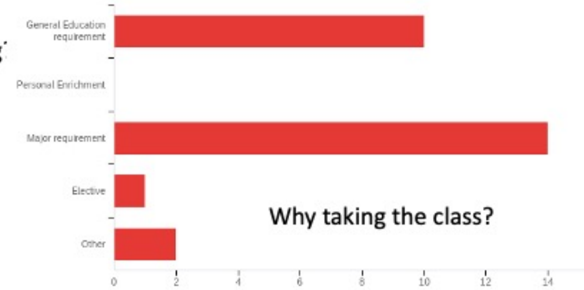
- The demographics indicate that education is not the exclusive priority of our students. They are balancing several needs at the same time: for example studies, employment, and care-giving.
- They do not spend the nominal 2 hours out of class for every hour in class
- They intend to graduate from Compton College
- Many want help to improve the adequacy of their skills which they deem necessary to succeed in our courses.
- Students desire to have OER/ZTC options and to have
- Students get help from many sources with their studies.
- There is the desire to have more tutoring. Many comment that they currently don't use them because of "time", but would use them 1-2 hours per week.
- Students rate our department either Excellent (16) or Good (9). One person rated us as Fair.
- Questions about our faculty indicate we are doing well by them.
- Students want more department classes at all times, but especially want more online classes.
- Half of the student have an idea about careers, and more than half don't know about careers that result from Astronomy, Physics, or Engineering.
- Of the respondents, only 2 were not going to transfer. Of the rest (23), two-thirds were going to stop with a BA/BS, while one-third wanted more.
- Many online students (40%) can't take courses on-campus because of their schedules, some (20%) though it was going to be easier. Many (40%) reported learning more in an on-line course than in a face-to-face class.
- Students rate their learning experience with us very highly.

What is your major?

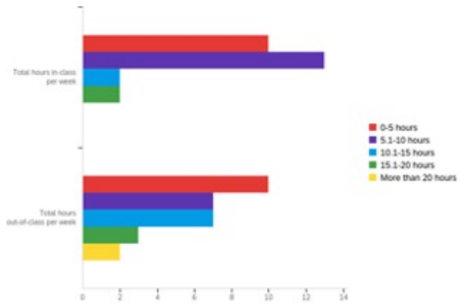


Which class are you taking?
A120/125 or P111 – 4
P120 or 122 – 6
P150/152/250/252 – 8
PSCI-125 – 8

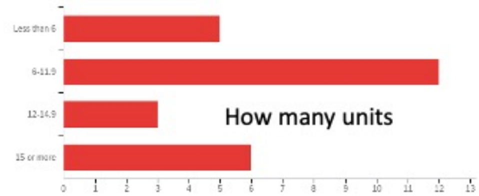
Why taking the class?



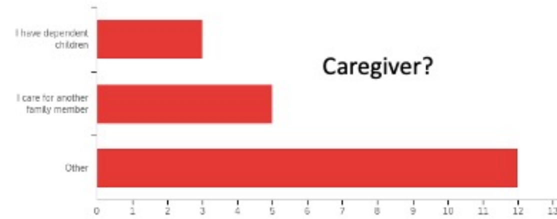
How many hours in-class & out-of-class



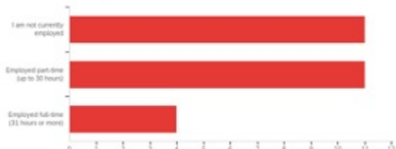
How many units



Caregiver?



Employment status



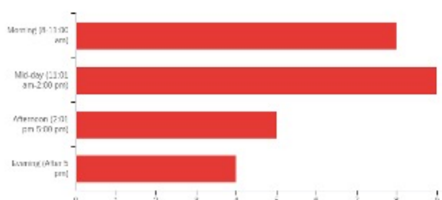
Factors affecting your school success

#	Answer	%	Count
1	Childcare	7.69%	3
2	Family obligations	30.77%	12
3	Work/Financial constraints	41.03%	16
4	Health issues	5.13%	2
5	Transportation problems	12.82%	5
6	Other	2.56%	1
	Total	100%	39

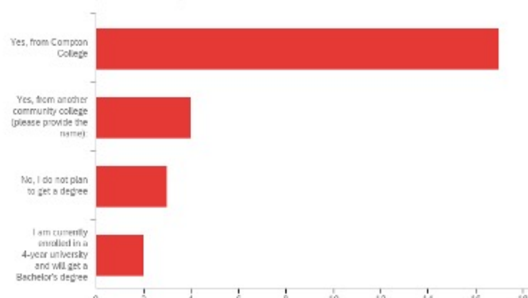
Properly prepared for English

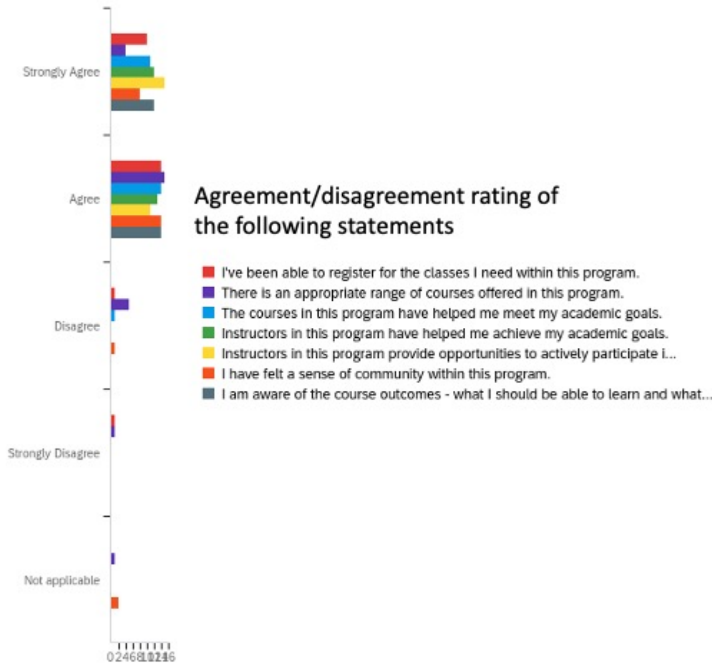
Properly prepared for Math

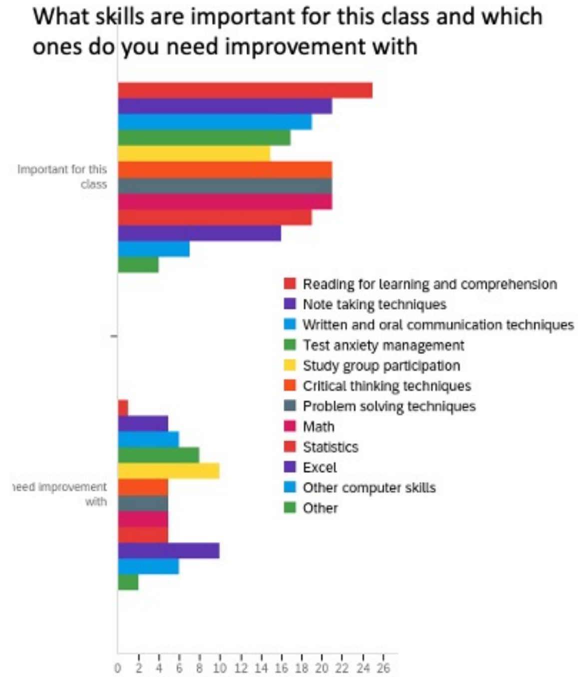
Course time preference



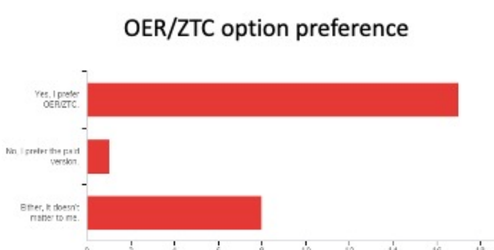
Compton degree?

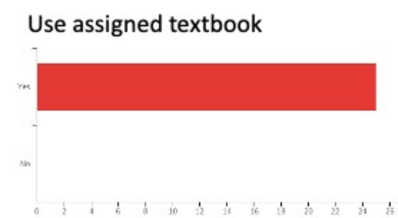


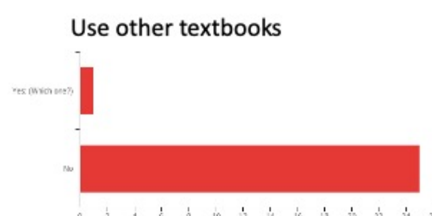


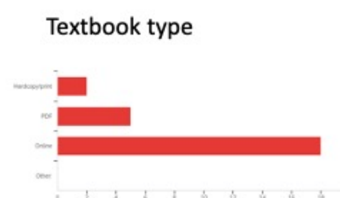


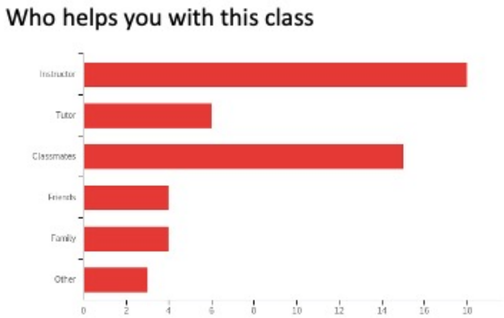
When did you get your textbook?		
I got my textbook by the end of the first week of class.	80.77%	21
I got my textbook during the second week of class.	15.38%	4
I got my textbook after the second week of class.	3.85%	1
I have no plans to obtain the textbook.	0.00%	0
I am having difficulty obtaining the textbook.	0.00%	0
Total	100%	26

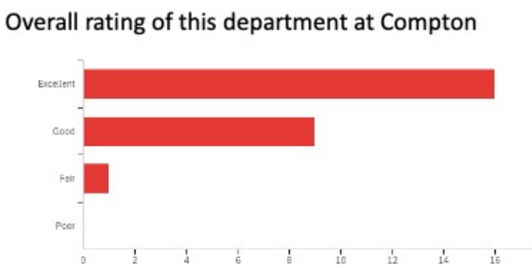




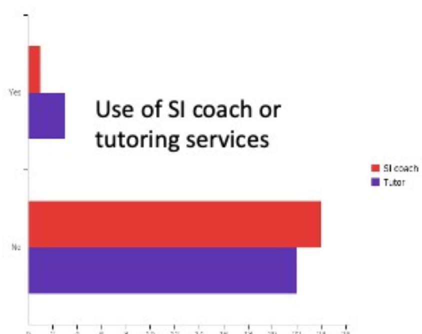


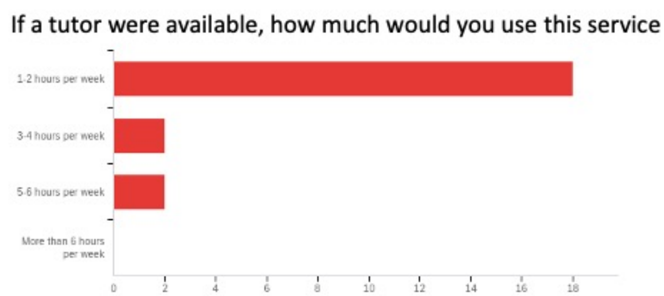


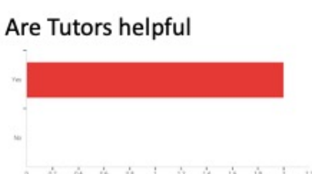

Who helps you with this class
Instructor
Tutor
Classmates
Friends
Family
Other

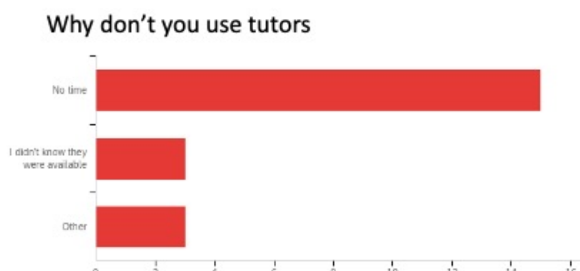

Overall rating of this department at Compton
Excellent
Good
Fair
Poor

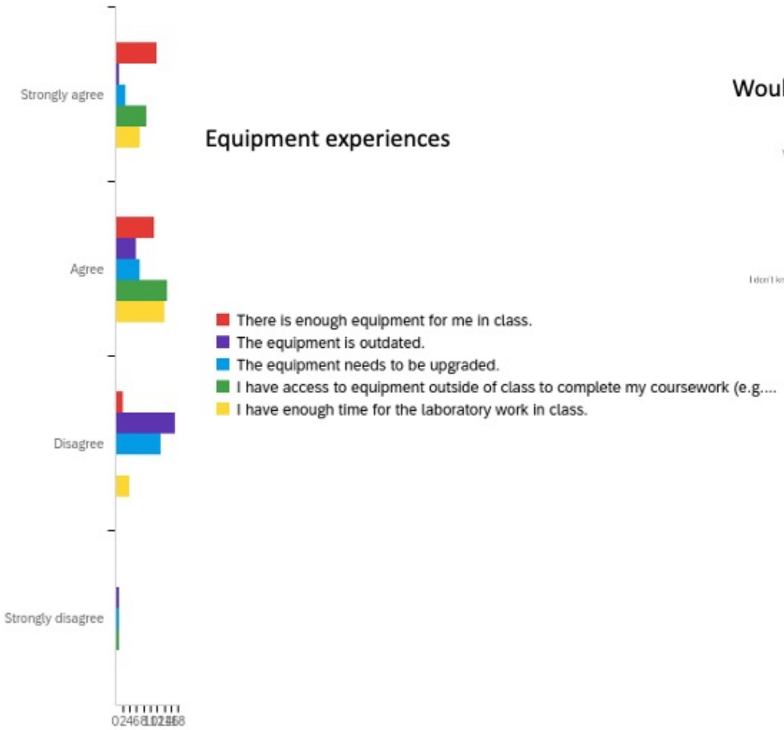

Questions about the instructor
Yes
No
Is the instructor approachable?
Do you know and understand the qualifications of the instructor?
Does the instructor know the material?
Does the instructor know how to teach?
Does the instructor allow you to show your capabilities (fairly)?
Does the instructor talk too much or too little?
Is there a language gap between you and the instructor?
Instructors in this department have helped me achieve my academic goals
Instructors in this department provide opportunities to actively participat...
Does the instructor provide enough examples so that I can practice the proc...

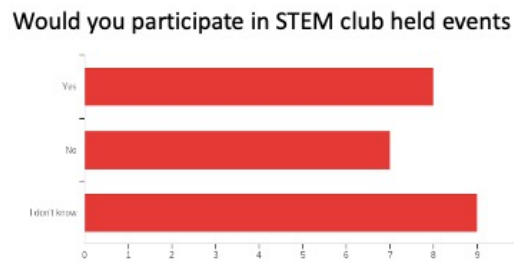

Use of SI coach or tutoring services
Yes
No
SI coach
Tutor

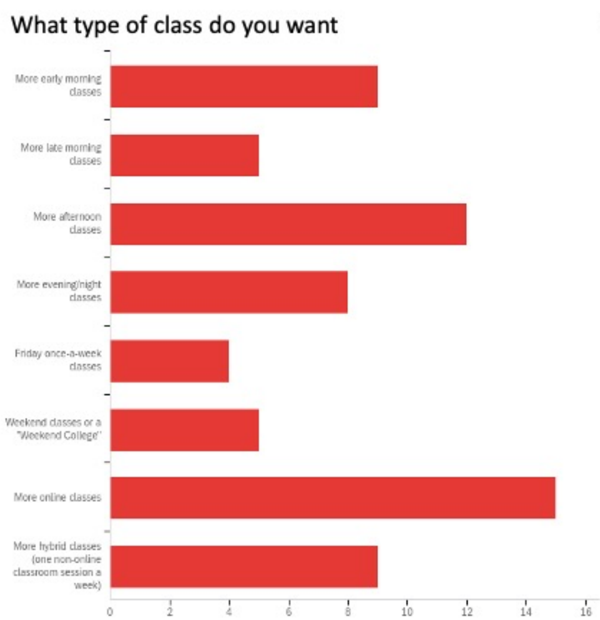

If a tutor were available, how much would you use this service
1-2 hours per week
3-4 hours per week
5-6 hours per week
More than 6 hours per week

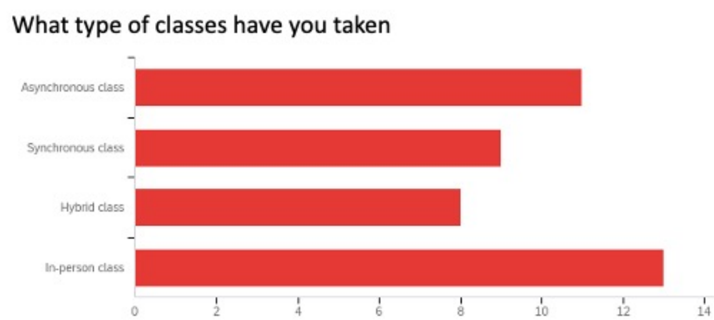

Are Tutors helpful

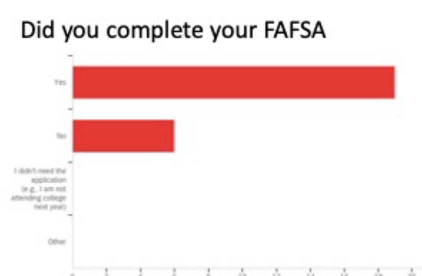

Why don't you use tutors
No time
I didn't know they were available
Other


Equipment experiences
Strongly agree
Agree
Disagree
Strongly disagree
There is enough equipment for me in class.
The equipment is outdated.
The equipment needs to be upgraded.
I have access to equipment outside of class to complete my coursework (e.g....
I have enough time for the laboratory work in class.

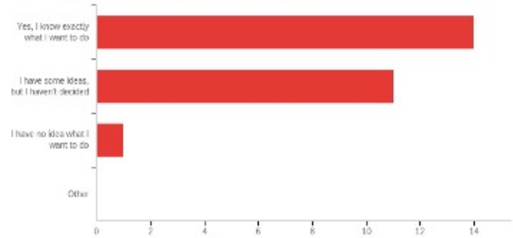

Would you participate in STEM club held events
Yes
No
I don't know
0
1
2
3
4
5
6
7
8
9


What type of class do you want
More early morning classes
More late morning classes
More afternoon classes
More evening/night classes
Friday once-a-week classes
Weekend classes or a "Weekend College"
More online classes
More hybrid classes (one non-online classroom session a week)
0
2
4
6
8
10
12
14
16

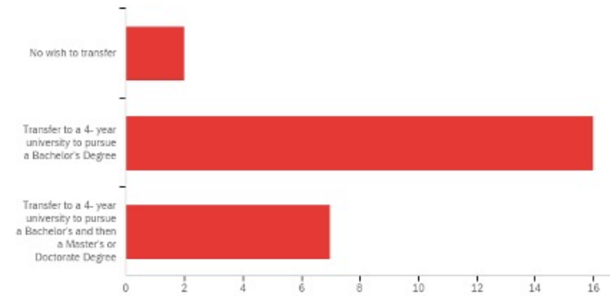

What type of classes have you taken
Asynchronous class
Synchronous class
Hybrid class
In-person class
0
2
4
6
8
10
12
14


Did you complete your FAFSA
Yes
No
Other

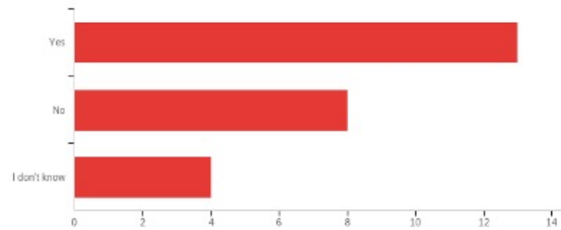
Have you thought about your career



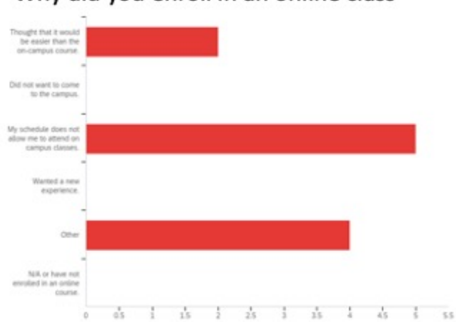
What are you transfer/educational goals



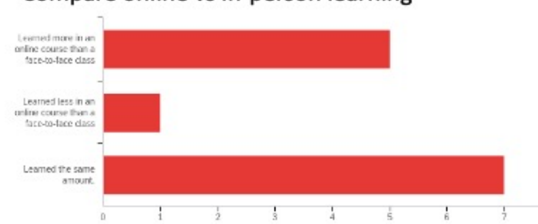
Do you know what jobs are available to people with Astronomy, Physics or Engineering degrees



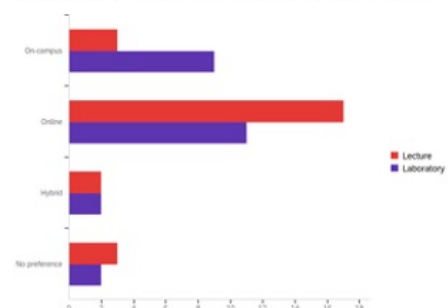
Why did you enroll in an online class



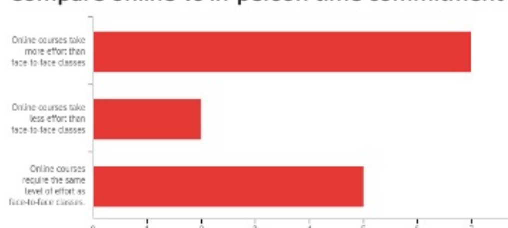
Compare online vs in-person learning

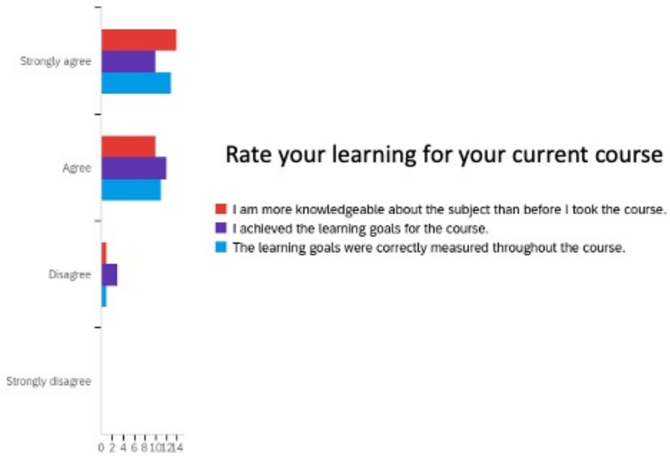


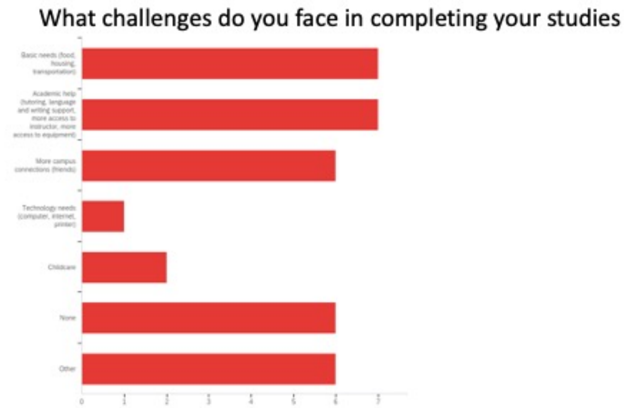
Class type preference for lecture and lab

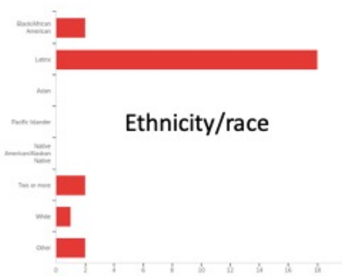


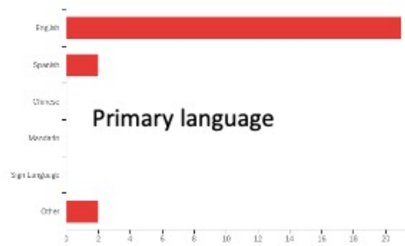
Compare online vs in-person time commitment

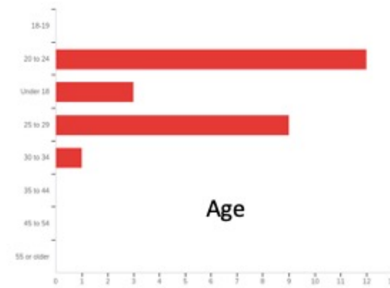








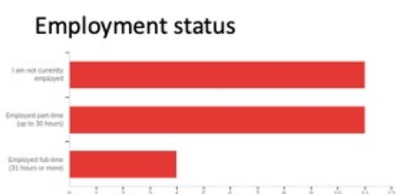




Describe the results of the student survey in the area of curriculum.

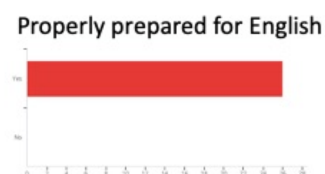
The current survey shows

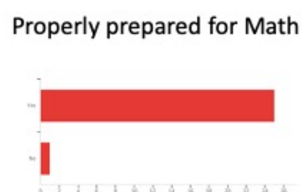
- Students consider themselves prepared for the level of English and Math necessary to succeed in our department
- Many want help to improve the adequacy of their skills which they deem necessary to succeed in our courses.
- Students desire to have OER and ZTC options
- Half of the student have an idea about careers, and more than half don't know about careers that result from Astronomy, Physics, or Engineering.
- Many online students (40%) can't take courses on-campus because of their schedules, some (20%) though it was going to be easier. Many (40%) reported learning more in an on-line course than in a face-to-face class.
- Students want more department classes at all times, but especially want more online classes.

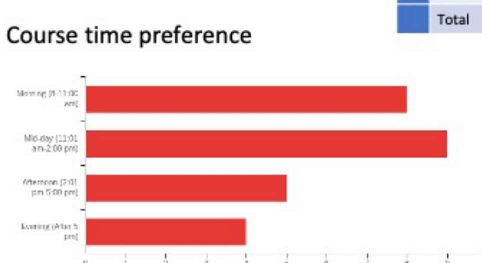


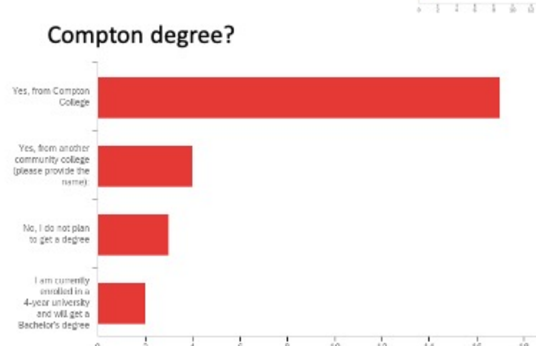
Factors affecting your school success

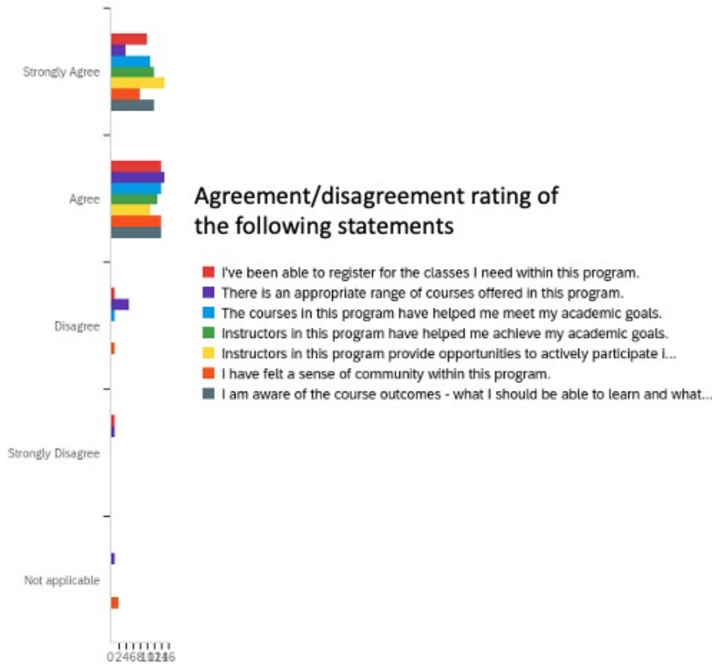
#	Answer	%	Count
1	Childcare	7.69%	3
2	Family obligations	30.77%	12
3	Work/Financial constraints	41.03%	16
4	Health issues	5.13%	2
5	Transportation problems	12.82%	5
6	Other	2.56%	1
	Total	100%	39

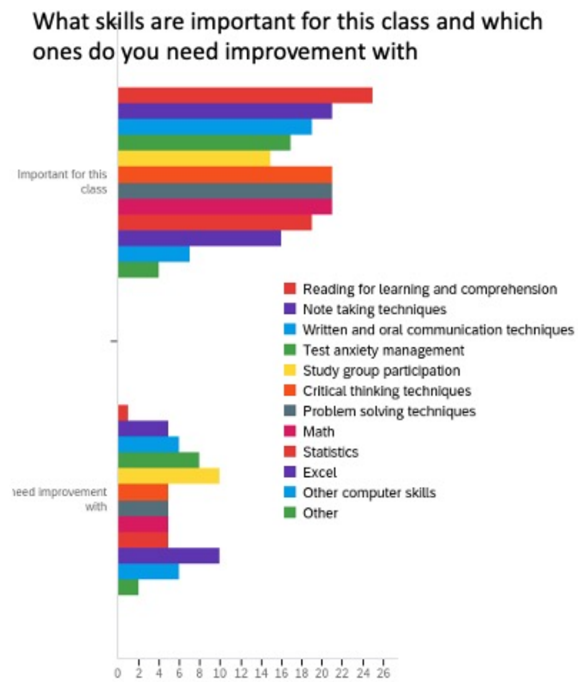


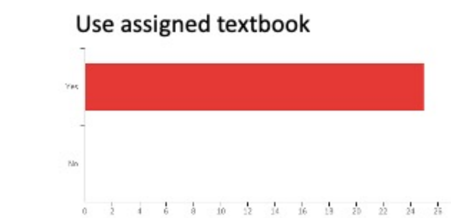




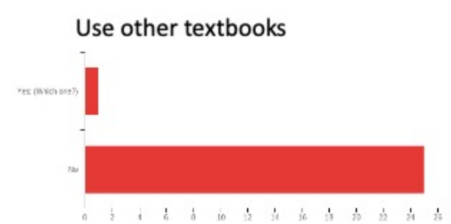


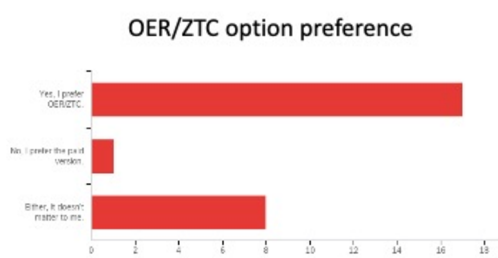


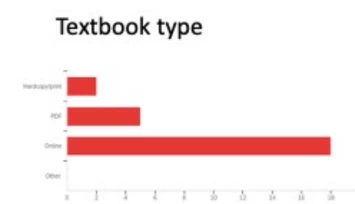




When did you get your textbook?		
I got my textbook by the end of the first week of class.	80.77%	21
I got my textbook during the second week of class.	15.38%	4
I got my textbook after the second week of class.	3.85%	1
I have no plans to obtain the textbook.	0.00%	0
I am having difficulty obtaining the textbook.	0.00%	0
Total	100%	26



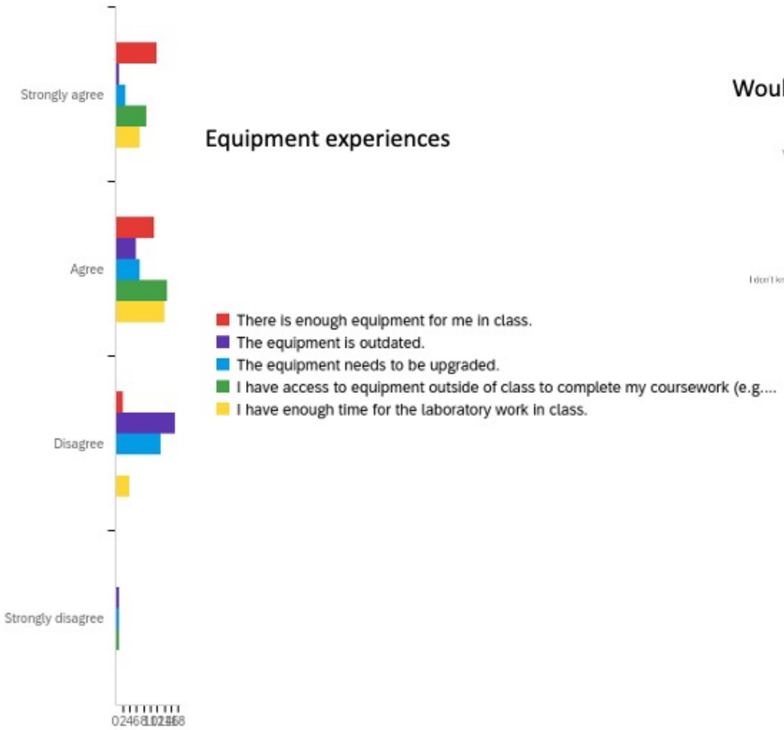


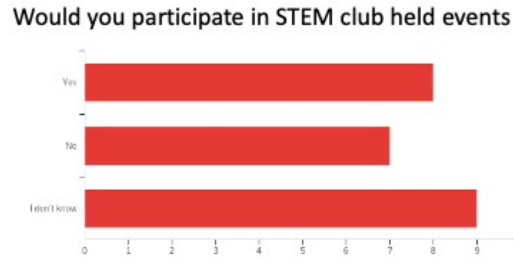


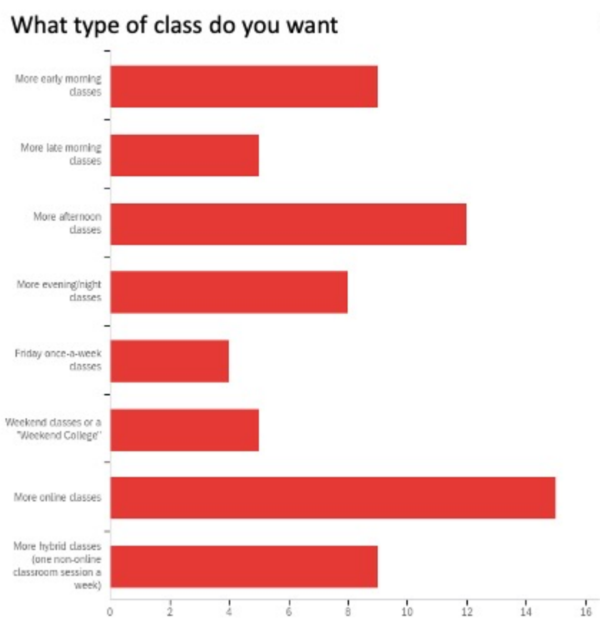
Describe the results of the student survey in the area of facilities, equipment and technology.

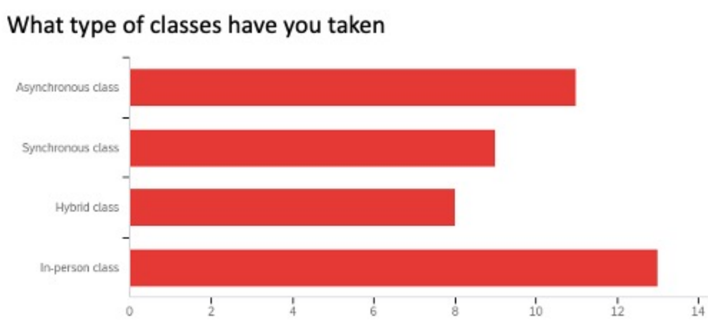
The current survey shows

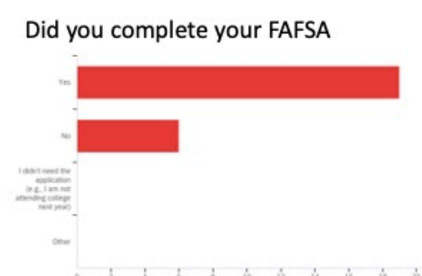
- There is a 50-50 sentiment that our equipment is outdated and needs to be upgraded.
- Many don't know about the STEM Club (~40%).

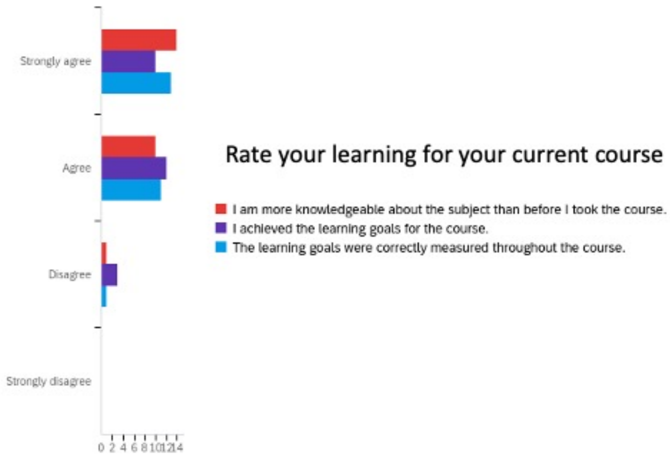

Equipment experiences
Strongly agree
Agree
Disagree
Strongly disagree
There is enough equipment for me in class.
The equipment is outdated.
The equipment needs to be upgraded.
I have access to equipment outside of class to complete my coursework (e.g....
I have enough time for the laboratory work in class.

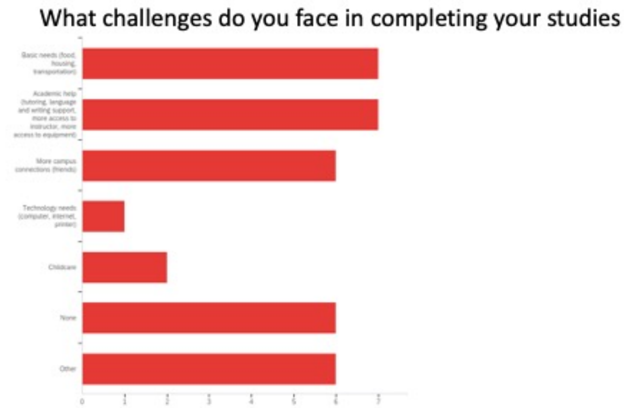

Would you participate in STEM club held events
Yes
No
I don't know
0 1 2 3 4 5 6 7 8 9

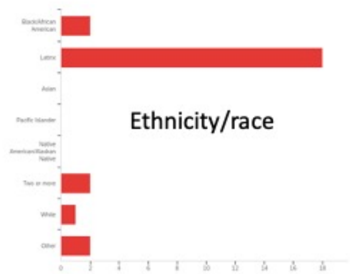

What type of class do you want
More early morning classes
More late morning classes
More afternoon classes
More evening/night classes
Friday once-a-week classes
Weekend classes or a "Weekend College"
More online classes
More hybrid classes (one non-online classroom session a week)
0 2 4 6 8 10 12 14 16

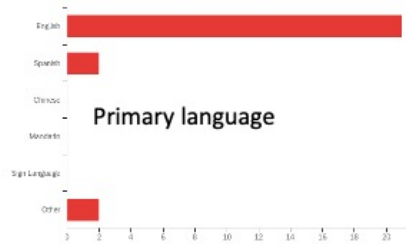

What type of classes have you taken
Asynchronous class
Synchronous class
Hybrid class
In-person class
0 2 4 6 8 10 12 14

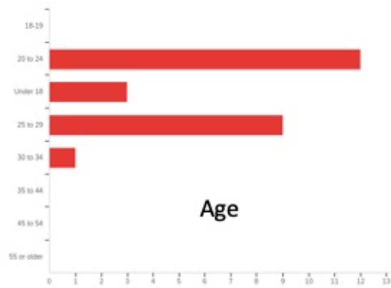

Did you complete your FAFSA
Yes
No
I didn't need the application (e.g., I am not attending college next year)
Other
0 2 4 6 8 10 12 14 16 18 20







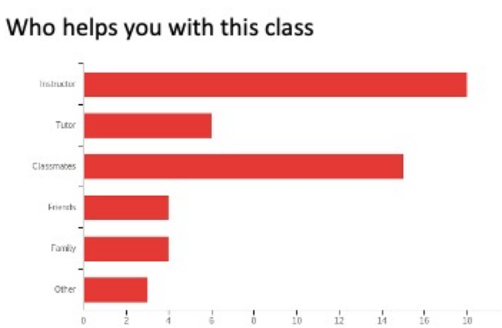


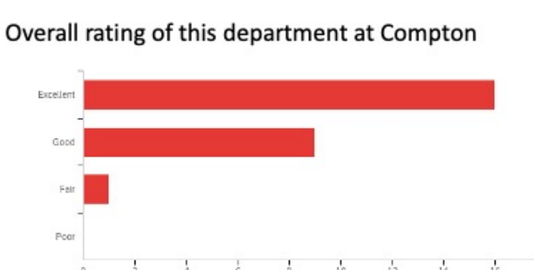


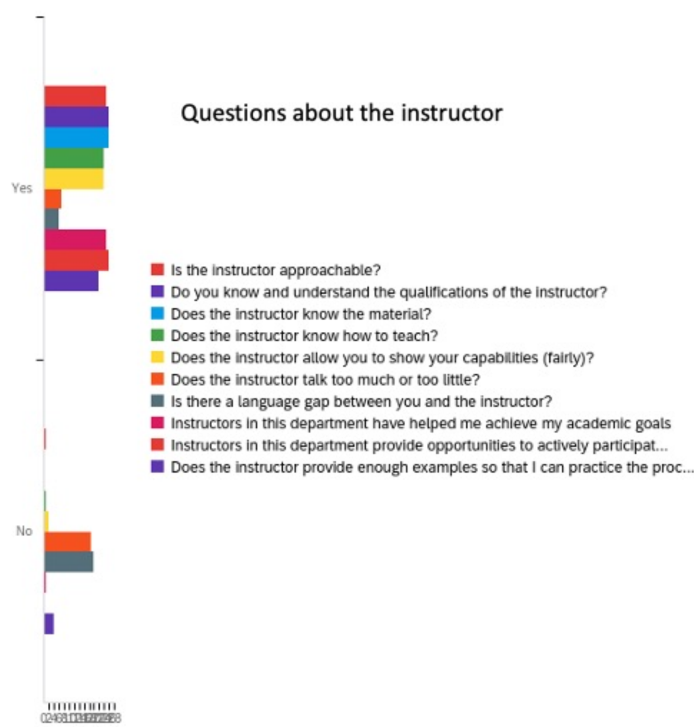
Describe the results of the student survey in the area of program objectives.

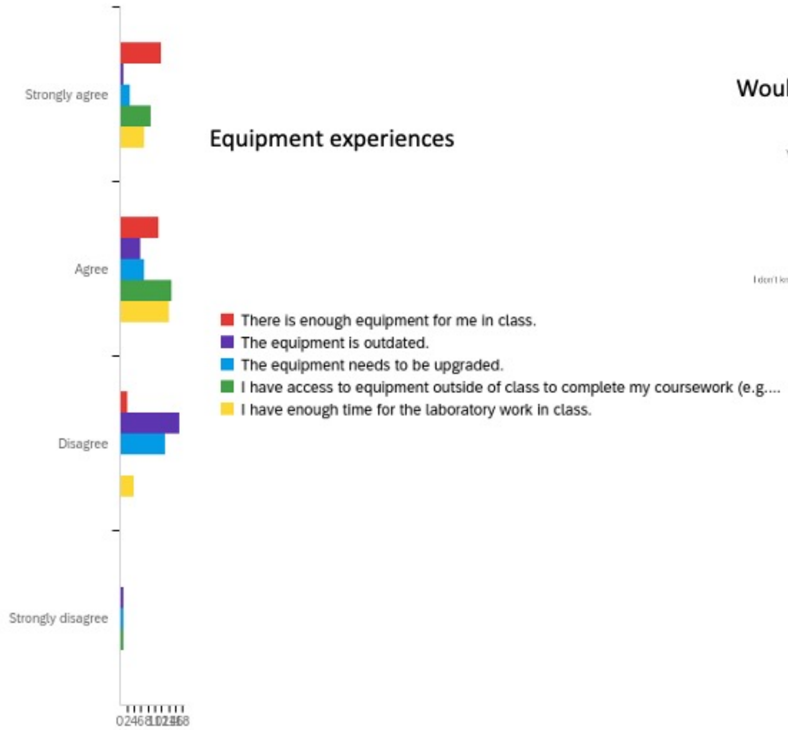
The current survey shows

- Many want help to improve the adequacy of their skills which they deem necessary to succeed in our courses.
- Of the respondents, only 2 were not going to transfer. Of the rest (23), two-thirds were going to stop with a BA/BS, while one-third wanted more.
- Half of the student have an idea about careers, and more than half don't know about careers that result from Astronomy, Physics, or Engineering.
- Students know what the learning goals are, and believe that they have achieved them.
- Students rate our department either Excellent (16) or Good (9). One person rated us as Fair.
- Questions about our faculty indicate we are doing well by them.
- Students rate their learning experience with us very highly.








Equipment experiences
Strongly agree
Agree
Disagree
Strongly disagree
There is enough equipment for me in class.
The equipment is outdated.
The equipment needs to be upgraded.
I have access to equipment outside of class to complete my coursework (e.g....
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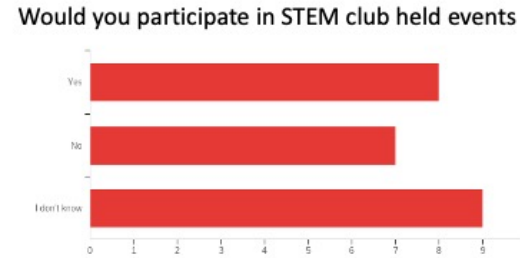
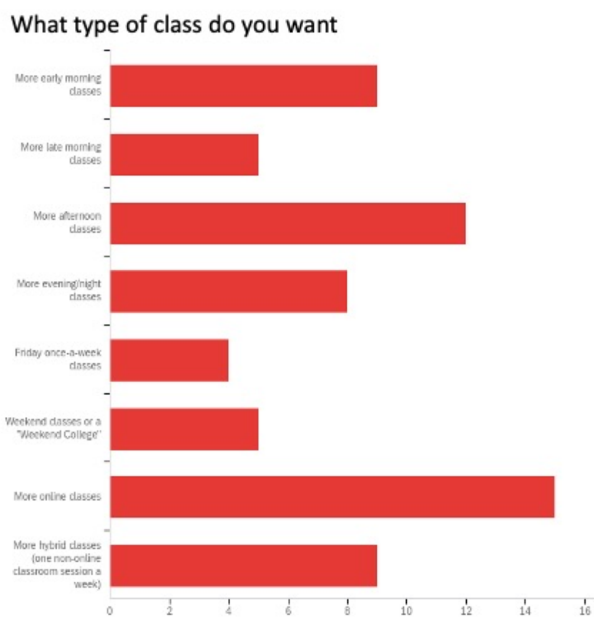

Would you participate in STEM club held events
Yes
No
I don't know
0 1 2 3 4 5 6 7 8 9


What type of class do you want
More early morning classes
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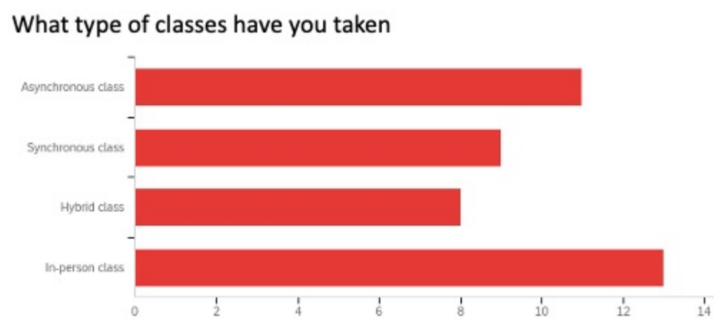
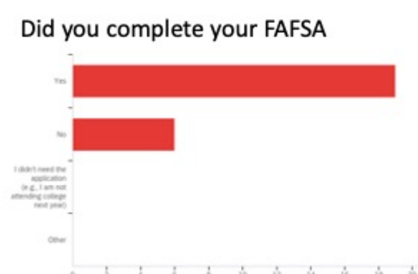
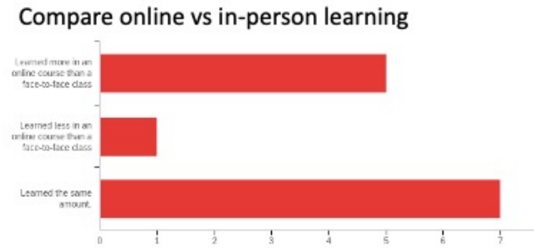
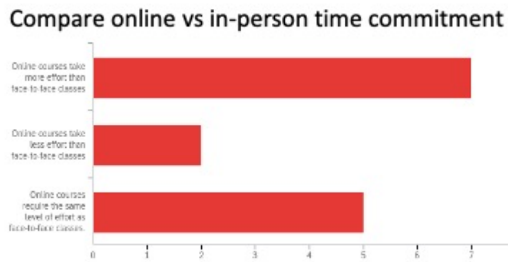
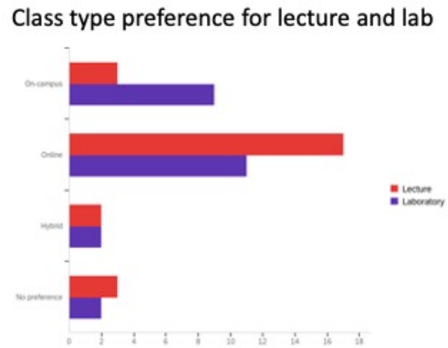

What type of classes have you taken
Asynchronous class
Synchronous class
Hybrid class
In-person class
0 2 4 6 8 10 12 14

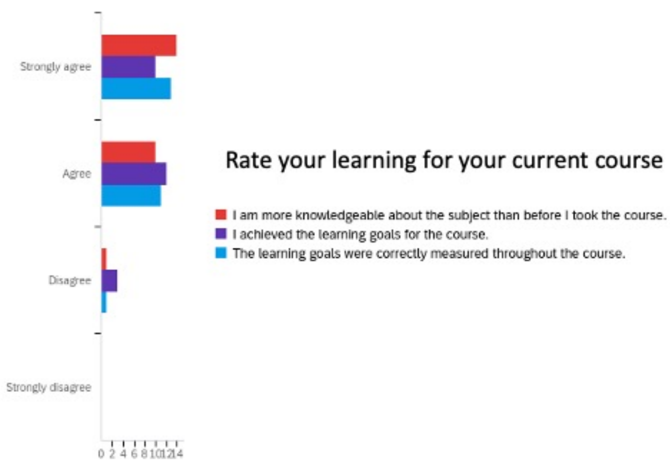

Did you complete your FAFSA
Yes
No
Other

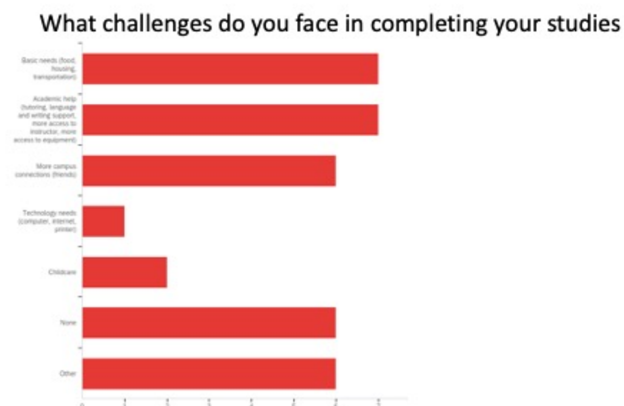

Why did you enroll in an online class
Thought that it would be easier than the on-campus course.
Did not want to come to the campus.
My schedule does not allow me to attend on campus classes.
Wanted a new experience.
Other
N/A or have not enrolled in an online course.

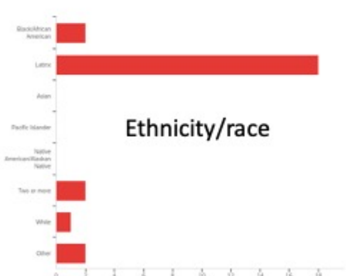

Compare online vs in-person learning
Learned more in an online course than a face-to-face class
Learned less in an online course than a face-to-face class
Learned the same amount.

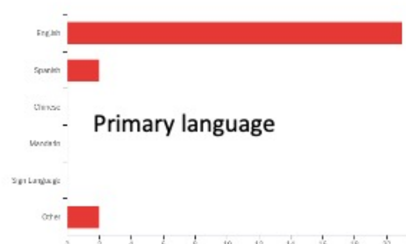

Compare online vs in-person time commitment
Online courses take more effort than face-to-face classes
Online courses take less effort than face-to-face classes
Online courses require the same level of effort as face-to-face classes.

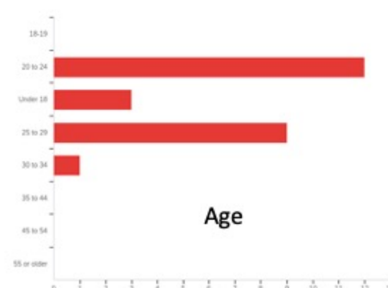

Class type preference for lecture and lab
On-campus
Online
Hybrid
No preference
Lecture
Laboratory

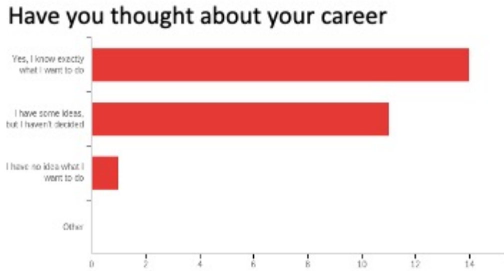

Rate your learning for your current course
Strongly agree
Agree
Disagree
Strongly disagree
I am more knowledgeable about the subject than before I took the course.
I achieved the learning goals for the course.
The learning goals were correctly measured throughout the course.

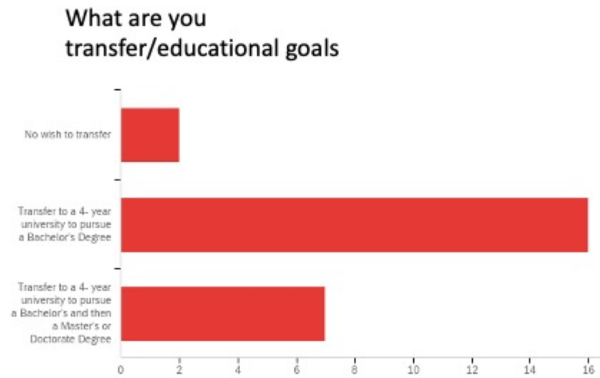

What challenges do you face in completing your studies
Basic needs (food, housing, transportation)
Academic help (tutoring, language and writing support, more access to instructor, more access to equipment)
More campus connections (friends)
Technology needs (computer, internet, printer)
Childcare
None
Other

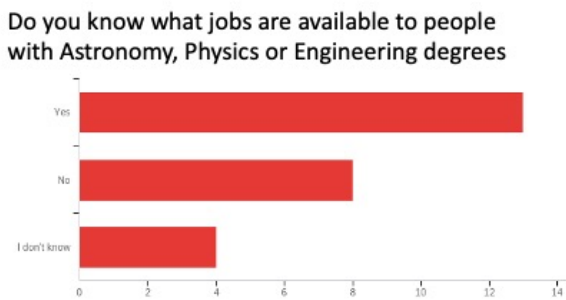

Ethnicity/race
Black/African American
Latinx
Asian
Pacific Islander
Native American/Alaskan Native
Two or more
White
Other


Primary language
English
Spanish
Chinese
Mandarin
Sign Language
Other


Age
18-19
20 to 24
Under 18
25 to 29
30 to 34
35 to 44
45 to 54
55 or older







Discuss the implications of the survey results for the program.
Given the survey results...

- We should discuss more about careers that result from Astronomy, Physics, or Engineering degrees.
- We should discuss how our courses fit into the larger scheme of the BA/MA/PhD studies.
- More online classes should be offered
- We need to get more equipment and upgrade that which we have.
- We need to get the word out about the STEM Club

Discuss the results of other relevant surveys (if applicable).
2018 Survey

We conducted our first survey in May/June 2018. It was conducted across all of our physics and astronomy classes. We had about 70 responses which were spread evenly across the courses taught during the semester. Our data was analyzed between the two different subject types, and differences are noted in the text. We provide the aggregate charts below.

We started with a simplistic view of our demographics as follows

1. Our Astronomy students confuse Astronomy with Astrology, or with learning the Astronomy Merit Badge.
2. Our Physics 1 students want to be engineers and are prepared for the mathematics. This sequence evolved into the 150/152/250/252 sequence
3. Our Physics 2 students want to be in the medical field and are competitively driven. This sequence evolved into the 120/122 sequence.

Our questions were created to test whether our beliefs were correct, and whether we were providing an educational product that met their needs. We also wanted to find out whether they understood some of the basic demands of a class, namely how much time they take. Finally, we wanted to understand the constraints that our students have in taking our classes, what is driving them.

Physics and Astronomy Program Survey

N = 71 | Spring 2018

1. Do you consider yourself a full-time student?

Response	Frequency	Percent	Mean: 1.24
Yes	53	74.65	
No	17	23.94	
Invalid	1	1.41	

2. Are you a caregiver?

Response	Frequency	Percent	Mean: 1.78
Yes	15	21.13	
No	54	76.06	
Invalid	2	2.82	

2a. If yes, how much time do you devote to caregiving per day?

Response	Frequency	Percent	Mean: 1.86
2 hours per day	12	16.90	
4 hours per day	5	7.04	
6 hours per day	1	1.41	
More than 6 hours per day	4	5.63	
Invalid	49	69.01	

3. Are you currently employed?

Response	Frequency	Percent	Mean: 1.46
Yes	37	52.11	
No	32	45.07	
Invalid	2	2.82	

3a. If yes, how much time do you devote to working per day?

Response	Frequency	Percent	Mean: 2.98
2 hours per day	6	8.45	
4 hours per day	8	11.27	
6 hours per day	8	11.27	
More than 6 hours per day	19	26.76	
Invalid	30	42.25	

4. Do you prepare food daily?

Response	Frequency	Percent	Mean: 1.34
Yes	45	63.38	
No	23	32.39	
Invalid	3	4.23	

4a. If yes, how much time do you spend preparing food for yourself or others?

Response	Frequency	Percent	Mean: 1.66
1 hour	26	36.62	
2 hours	17	23.94	
3 hours	5	7.04	
More than 3 hours	2	2.82	
Invalid	21	29.58	

5. Is English your first language?

Response	Frequency	Percent	Mean: 1.45
Yes	37	52.11	
No	30	42.25	
Invalid	4	5.63	

5a. If English is not your first language, are you comfortable with your ability to use English for understanding this class?

Response	Frequency	Percent	Mean: 1.02
Yes	42	59.15	
No	1	1.41	
Invalid	28	39.44	

6. What factors do you believe affect your ability to attend class or complete the semester? (Select all that apply.)

Response	Frequency	Percent	Mean: -
Child care	6	8.45	
Family obligations	30	42.25	
Work/Financial constraints	34	47.89	
Health issues	18	25.35	
Transportation problems	17	23.94	
Other please specify	1	1.41	
Invalid	7	9.86	

9. Are you planning to earn a degree from Compton?

Response	Frequency	Percent	Mean: 1.26
Yes	52	73.24	
No	18	25.35	
Invalid	1	1.41	

10. Are you planning to earn a degree from another college?

Response	Frequency	Percent	Mean: 1.27
Yes	51	71.83	
No	19	26.76	
Invalid	1	1.41	

11. Are you currently enrolled at a 4-year institution?

Response	Frequency	Percent	Mean: 1.83
Yes	12	16.90	
No	58	81.69	
Invalid	1	1.41	

12. How did you find out about this class?

Response	Frequency	Percent	Mean: 2.84
Course catalog	27	38.03	
Friend/family	5	7.04	
Instructor	3	4.23	
Counselor or advisor	29	40.85	
Flyer	0	0.00	
Website or social media	5	7.04	
Other	1	1.41	
Invalid	1	1.41	

13. Which of the following is your biggest reason for taking this class?

Response	Frequency	Percent	Mean: 1.64
GE requirement	27	38.03	
Major requirement	41	57.75	
Personal interest	2	2.82	
Elective	0	0.00	
Invalid	1	1.41	

14. Which of the following is your biggest reason for taking this class at Compton College?

Response	Frequency	Percent	Mean: 2.47
Fits my schedule	28	39.44	
Close to work	2	2.82	
Close to home	33	46.48	
It was cheaper	0	0.00	
Other	7	9.86	
Invalid	1	1.41	

49a. Do you understand the difference between an online class and a correspondence class?

Response	Frequency	Percent	Mean: 1.21
Yes	54	76.06	
No	14	19.72	
Invalid	3	4.23	

49b. An online class allows me to progress at my own pace.

Response	Frequency	Percent	Mean: 1.30
True	45	63.38	
False	19	26.76	
Invalid	7	9.86	

49c. Were you properly prepared to take an online class?

Response	Frequency	Percent	Mean: 1.46
Yes	33	46.48	
No	28	39.44	
Invalid	10	14.08	

49d. Why did you enroll in an online course?

Response	Frequency	Percent	Mean: 3.77
Thought it would be easier than the on-campus course	7	9.86	
Did not want to come to the campus	4	5.63	
My schedule does not allow me to attend on-campus classes	29	40.85	
Wanted a new experience	3	4.23	
Other	1	1.41	
N/A or have not enrolled in an online course	21	29.58	
Invalid	6	8.45	

49e. If you've taken an online class, please compare your experience to on-campus classes.

Response	Frequency	Percent	Mean: 3.28
Learned more in the online class than a face-to-face class	3	4.23	
Learned less in the online class than a face-to-face class	15	21.13	
Learned the same amount in both types of classes	13	18.31	
Online course took more effort than face-to-face classes	7	9.86	
Online course took less effort than face-to-face classes	0	0.00	
Online course required the same level of effort as face-to-face classes	9	12.68	
Invalid	24	33.80	

50. What skills do you think are most important for succeeding in this class? (Select all that apply.)

Response	Frequency	Percent	Mean: -
Reading for learning and comprehension	45	63.38	
Note-taking techniques	37	52.11	
Written and oral communication techniques	23	32.39	
Test anxiety management	23	32.39	
Study group participation	37	52.11	
Critical thinking techniques	42	59.15	
Problem solving techniques	49	69.01	
Time management	47	66.20	
Invalid	1	1.41	

51. What skills do you think you need to improve? (Select all that apply.)

Response	Frequency	Percent	Mean: -
Reading for learning and comprehension	18	25.35	
Note-taking techniques	13	18.31	
Written and oral communication techniques	9	12.68	
Test anxiety management	25	35.21	
Study group participation	17	23.94	
Critical thinking techniques	16	22.54	
Problem solving techniques	23	32.39	
Time management	41	57.75	
Invalid	1	1.41	

52. Who do you go to in order to get help for this class?

Response	Frequency	Percent	Mean: -
Instructor	47	66.20	
Tutor	20	28.17	
Classmates	45	63.38	
Friends	17	23.94	
Family	6	8.45	
Other	2	2.82	
Invalid	1	1.41	

54. Are you planning to earn a BA or BS degree?

Response	Frequency	Percent	Mean: 1.04
Yes	67	94.37	
No	3	4.23	
Invalid	1	1.41	

55. Are you planning to earn an MA, MS, or PhD?

Response	Frequency	Percent	Mean: 1.29
Yes	49	69.01	
No	20	28.17	
Invalid	2	2.82	

56. Generally speaking, do you think education is a good investment?

Response	Frequency	Percent	Mean: 1.00
Yes	70	98.59	
No	0	0.00	
Invalid	1	1.41	

57. Do you know what jobs are available to a person with a degree in Physics?

Response	Frequency	Percent	Mean: 1.60
Yes	27	38.03	
No	41	57.75	
Invalid	3	4.23	

58. Do you know what jobs are available to a person with a degree in Astronomy?

Response	Frequency	Percent	Mean: 1.71
Yes	20	28.17	
No	49	69.01	
Invalid	2	2.82	

41. Is the equipment outdated?

Response	Frequency	Percent	Mean: 1.63
Yes	25	35.21	
No	42	59.15	
Invalid	4	5.63	

42. Does the equipment need to be upgraded?

Response	Frequency	Percent	Mean: 1.37
Yes	43	60.56	
No	25	35.21	
Invalid	3	4.23	

43. Do you have access to needed equipment outside of class (e.g., computers)?

Response	Frequency	Percent	Mean: 1.18
Yes	56	78.87	
No	12	16.90	
Invalid	3	4.23	

43a. If yes, is this access timely and adequate?

Response	Frequency	Percent	Mean: 1.18
Yes	50	70.42	
No	11	15.49	
Invalid	10	14.08	

44. Do you have enough time to complete the laboratory work?

Response	Frequency	Percent	Mean: 1.15
Yes	57	80.28	
No	10	14.08	
Invalid	4	5.63	

45. Which class is this?

Response	Frequency	Percent	Mean: 3.69
Astronomy 12	15	21.13	
Astronomy 20/25	10	14.08	
Physics 1A/1B/1C/1D	14	19.72	
Physics 2A/2B	12	16.90	
Physics 11	0	0.00	
Physics 12	0	0.00	
Physcial Science 25	19	26.76	
Invalid	1	1.41	

48. If you were able to register for the classes you needed but had problems doing so, then what solution(s) do you recommend?

Response	Frequency	Percent	Mean: -
More early morning classes	43	60.56	
More late morning classes	26	36.62	
More afternoon classes	18	25.35	
More evening/night classes	14	19.72	
Friday once-a-week classes	8	11.27	
Weekend classes or a Weekend College	14	19.72	
More online classes	18	25.35	
More hybrid classes one non-online classroom session per week	5	7.04	
Other	2	2.82	
Invalid	1	1.41	

49. Have you taken an online class?

Response	Frequency	Percent	Mean: 1.37
Yes	44	61.97	
No	26	36.62	
Invalid	1	1.41	

Physics and Astronomy Program Survey

N = 71 Spring 2018

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Invalid	1	1.41	

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Invalid	28	39.44	

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Health issues	18	25.35	
Transportation problems	17	23.94	
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Invalid	1	1.41	

11. Are you currently enrolled at a 4-year institution?

Response	Frequency	Percent	Mean: 1.83
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No	58	81.69	
Invalid	1	1.41	

12. How did you find out about this class?

Response	Frequency	Percent	Mean: 2.84
Course catalog	27	38.03	
Friend/family	5	7.04	
Instructor	3	4.23	
Counselor or advisor	29	40.85	
Flyer	0	0.00	
Website or social media	5	7.04	
Other	1	1.41	
Invalid	1	1.41	

13. Which of the following is your biggest reason for taking this class?

Response	Frequency	Percent	Mean: 1.64
GE requirement	27	38.03	
Major requirement	41	57.75	
Personal interest	2	2.82	
Elective	0	0.00	
Invalid	1	1.41	

14. Which of the following is your biggest reason for taking this class at Compton College?

Response	Frequency	Percent	Mean: 2.47
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Close to work	2	2.82	
Close to home	33	46.48	
It was cheaper	0	0.00	
Other	7	9.86	
Invalid	1	1.41	

From our survey, our students consider themselves full-time students (75%), and are also employed (52%). Of those that are employed, 51% are working full-time. Half of our students report that work/financial constraints impact their academic participation. Half also report that they are impacted by family obligations. Significant fractions are also impacted by health and transportation issues (25% each). Further down in the survey, we find that they spend about 1 hour outside of class for every hour in class. This should be compared to the definition of a credit hour: 2 hours outside for every hour inside.

Most of our students intend to get a degree from Compton (80%), although a third of the physics students are getting their degree from another institution. Students are taking Astronomy because of GE requirements, while the Physics students are fulfilling their major requirements. They found out about our classes either through the course catalog or through counselors. Our classes have the advantage of being close to their home, or fit their schedules.

A significant fraction of our Astronomy students feel that they were not prepared for the mathematics used in the class. A logical extension could be that those students that have dropped because of this lack of mathematical confidence or ability. On the other hand, 96% of our Physics students feel that they are adequately prepared mathematically.

Our students understand and agree with the course design, and its relation to Student Learning Outcomes. Unfortunately, the comments received in association with having them state the course SLOs are more somewhat disconnected. If one was to guess, our students do not know what an SLO is. We plan to explain this more to our students at the beginning of the semester

Fifty percent of our physics students use the tutor/SI-coach. Since we don't have a tutor for Astronomy, 88% of the Astronomy students do not use a tutor. Most students would use a tutor from 1 to 4 hours weekly. Students use the assigned textbook, and 25% use additional textbooks. Unfortunately, about one-third get the textbook during the second week of class. Two-thirds of the physics students utilize online resources like the Khan academy or the MIT lectures, while it is 50-50 for the astronomy students. What is interesting is that 70% would like to see extracurricular events like guest lectures or star parties.

About 70% of students indicated there was enough equipment. Only 35% of students said the equipment was outdated, but 61% of students said the equipment needs to be upgraded. Most students (79%) indicated they have access to the necessary equipment outside of class, and 70% of students said the access to this equipment is timely and adequate. Most students (80%) also said they have enough time to complete the laboratory work.

Students are highly satisfied with their instructors. They feel that they are highly qualified in their fields, approachable, available, and fair with their assessments.

Our students claim to understand the difference between online and correspondence classes (76%), although they all say that online classes allow them to learn at their own pace (64%). As Institutional Effectiveness pointed out, "Students could perceive "progressing at their own pace" as choosing what time of day they will review the material and how long they will spend on it".
Students perceive they were not ready to take online courses, but took them because of scheduling issues. The level-of-effort required for and rigor in our online classes seem to be equivalent to that for our face-to-face classes.

2022 Alumni Review

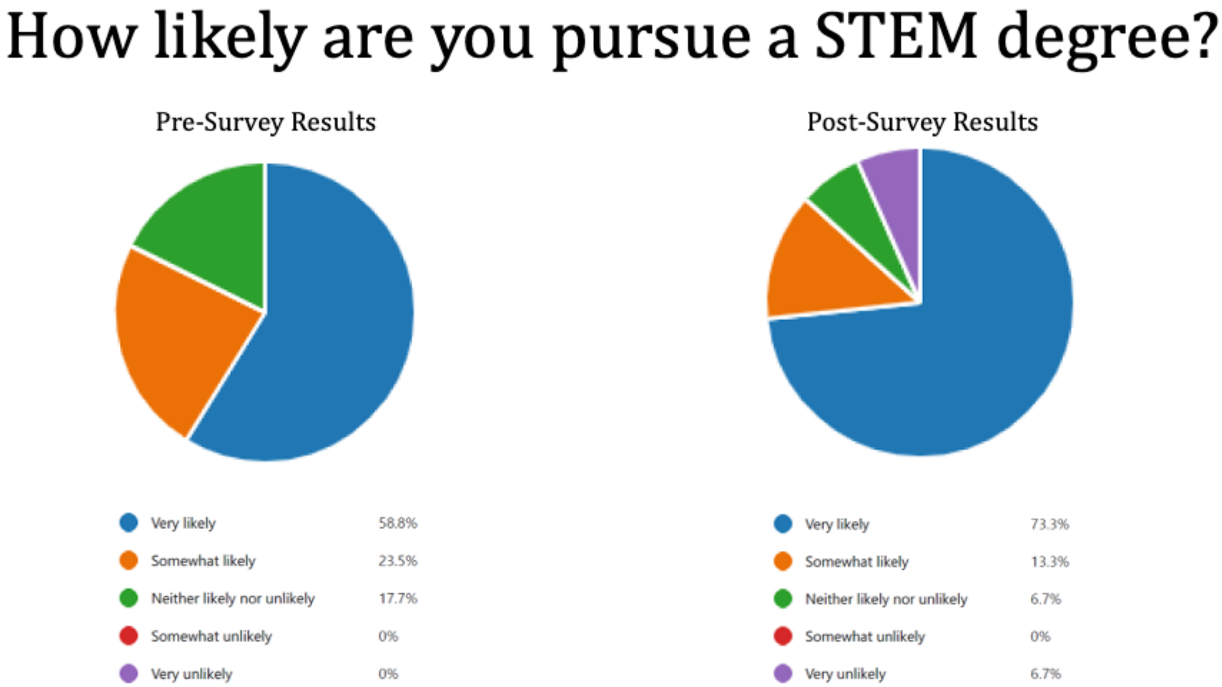
Over summer (2022), Lorena Fonseca set up with 3 alumni (Tre, Diana, Jamie) a review of my Physics classes. Concentration on Physics 120 and Physics 150. Furthermore, the concentration was respect to that visible on Canvas Shells.

- We looked at the organization of the Canvas Shells. Decided to make them more like Astronomy 120. Particularly hide all assignments, except those in the immediate future (2 weeks).
- Reviewed the labs. Try to separate the labs – make them different for the different sequences.

- Discussed the Polya Method and what are reasonable expectations for Physics 120 and Physics 150 sequences. Changes have been ongoing from Fall 2021 to Spring 2022.

Make-It-Happen

During the Covid lock-down, we instituted a methodology to provide students with electronic kits. We have done this several times (Spring 2021, Fall 2022, Spring 2022, and Fall 2022). As evidenced by the survey following, we improved the visibility of the STEM types of careers...



List any related recommendations
Recommendations from 2021 survey

- Have more tutors available during the course of the day and week.
- Our equipment needs to be upgraded
- Half of the student have an idea about careers, and more than half don't know about careers that result from Astronomy, Physics, or Engineering.
- Knowledge of the STEM Club needs to become more wide spread.
- We need to have more classes, and more online classes
- We need to maintain the Make-It-Happen and STEM Club projects

Recommendations from 2018:

- The astronomy class should incorporate a mathematics section that reviews what is needed for the class.
- Incorporate the free OpenStax books across the board to eliminate lack of textbooks in the first two weeks.
- Increase the availability of tutoring to include astronomy.
- Incorporate into the class time a discussion of the advantage of physics and astronomy degrees for employment opportunities.
- Equipment needs to be upgraded.
- Design and promote topical science lectures and star parties.
- Prepare students to take online classes.

Academic Program Review: (6) Facilities and Equipment First Submission: Version by **Schwitkis, Kent** on **12/05/2022 21:24**

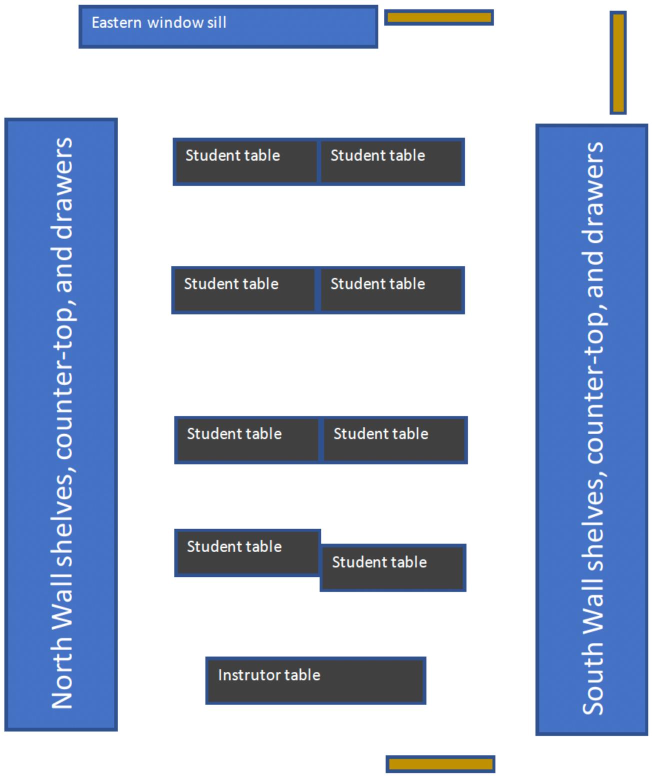
Describe and assess the existing program facilities and equipment.
All of the Physics/Astronomy classes and laboratories are taught in one classroom. The department also has one room that serves as stockroom and has an observatory. Our usable space is limited and will impede the growth of the department. For example, the lecture room is meant to be used as a laboratory space, but electrical outlets are only along the walls of the room. A second example, is the storeroom has cabinets that rise 20 feet above the floor, we don't have a movable ladder to utilize the top five feet of vertical height.

There is no timetable for the maintenance of the equipment.

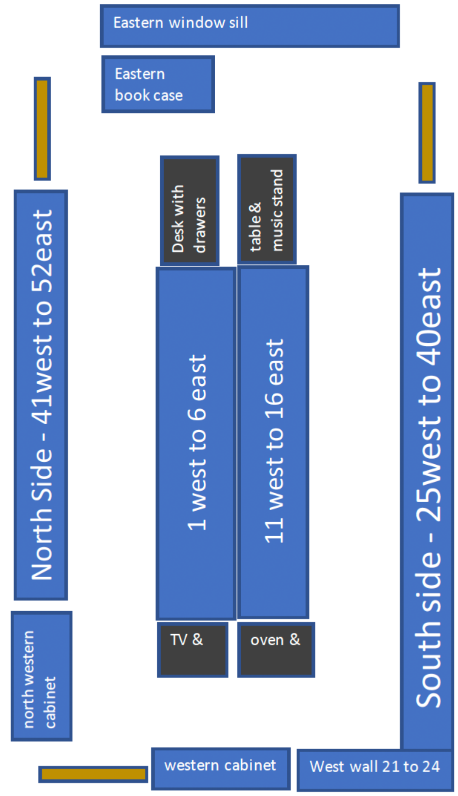
Incorporation of Do-It-Yourself (DIY) hardware has been included in experiments and demonstrations. This has been meet with unexpected enthusiasm. These DIY experiments/demos are less expensive on a per unit basis and typically are simpler to explain and connect better with the topic.

We created an inventory of our equipment and spaces in the spring of 2014. People, including the author are not contentious with its maintenance. **See the figures below for a few of the pages of the latest version.**

Room 126



Room 127



North side wall MS126

Shelves west to east (1 to 10)

1 random papers, spirograph
2 1.7 GYA rocks, 550 MYA fossil, 50 MYA fossil, x2 crookes radiometers
3 cleaning station - conic section, sun/earth/moon model (broken) for phases
4 microscopes?
5 example cd spectrometers
6
7 galileo scope, 6x hand magnifying glass
8 box whistle with slide
9 3 tuning forks plus resonator box

table

1 1 light table (meter long, 4 feet (2 pairs) adjustible, light source_lense+2holders
2 heavy azimuth circular table ~350 mm across azimuth markings in degrees
3 conic section model
4 meter and 2-meter sticks
5 corning hot plate
6 celestial sphere model
7 test tube stand
8 object looks like oven
9 cosmic ray box
10 posters

North side wall - cabinents and drawers

1	2A	3A	4A	5A	6	7	8A
	2B		4B				8B
	2C		4C				8C
	2D		4D				8D

1 empty
2A 1 foot rulers, protractors, 100' measuring tape (sometimes floats in 2B-2D
2B 7 astrolabs, 2 broken astrolabs, 24 planespheres/star planet locators
2C paper supplies for astro lab, scissors (at least 9)
2D 5 mark 3 sextants & instructions,
3A 3 plastic calipers, 4 metal calipers, 2 micrometers
4A empty
4B gratings, spectrum tubes, power supplies; 10 spectrometers (plastic eisco - cat no PH0100QA)
4C 8 power supplies, tubes, h, he, neon, hg, he, n2, h+he, o2, h2, he, hw0, air co2
5A empty
6 empty
7 empty
8A graded papers for KAS class
8B graded papers for KAS class
8C graded papers for KAS class
8D graded papers for KAS class

South side wall MS126

Cabinets west to east (1 to 10) top/bottom

1 cleaning station
2A pie pans, x5 holders for center of mass experiments
2B wood blocks
2C 5 scales
3A alumin cups
3B alumin cups
3C graduated cylinders
4A newton pendulum
4B solid disk & ring (moment of inertia demo)
4C density determination lab materials
5A x5 variable diamter pulley; cardboard sheets; 2 ice cube trays
5B timers, poly density bottle (density differentiation demo)
5C timers
6A hewitt railroad wheels, bouancy diver, oil/water differentiation
6B box of mirrors/lenses
6C box pendulum balls, box of al/cu cylinders, weights

South wall counter

posts
meter & 2 meter sticks
2 light tables + moon descent lamp + adjustable slit + 2 holder + lense screen
3 test tube stands + 5 heating holders
hot plate
cosmic ray detector, al bars for stands

South wall drawers

[redacted]		
cabinet just south of west door		
	2 boxes of tools	
	4x BK precision 2120 dual trace oscilloscope, 30MHz	
	1x HP 1220A dual trace oscilloscope	
	1x electrostatics demo box (silk cloth, rabbit fur, balloons, plexiglass rods, UV lamp, AL cans	
	1x electroscope for photoelectric effect	
cabinet NW corner		
	posters	
[redacted]		
north		
x2	4 drawer file need to look	
x1	2 drawer file need to look	
x1	desk + 2 drav need to look	
	box on top of need to look	
south	table (stuff)	
	music stand	
	6 rod assembly	
x3	set of large (~1meter diameter) convex and concave mirror from Arbor scientific	
[redacted]		
East wall	north to south	
window sill		
	WD 40	
	aquarium for showing diffraction of light (like sky)	
	1 glider air track plus air compress - 2 big & 2 small gliders - (2 fan carts in boxes - assessory box, both unopened)	
	bag of ~ square glass	
	1 stand + rod upright + cross piece	
	electrostatic generator	
book case		
	1x geometric optic kit PASCO OS-8518	
	1x sonometer - WA-9611 PASCO	
	1x Cenco advance torsion apparatus CP74050-01	
	1x WA-9612 resonance tube PASCO	
	x6 1x6 wood planes with paper covering + attached pulley for incline plane studies	
west and east end of cabinet assembly - many threaded steel rods - maybe for stands		
table east side 49 east - 4 boxes need to be checked, x2 light bars		
[redacted]		
north table/c	x6 force vector tables with stand (each one has ~ 4 pulleys, each has 4 strings attached to a central ring), x1 force vector dem ta	
[redacted]		
1/2AA	empty	
1A/2A	x4 Leed & northrup?, 1 stand	
1B/2B	electron gun (EB-IIIB), pasco OS-8537 spectrophotometer acc	
1C/2C	PASCO OS-8533 polariation analyzer, 2x unopened OS-8535 linear translater, 1x OS-8534 aperature bracket, x2 pasco OS-8526 x	
1D/2D	Pasco os-8523 slit acc basic optics x3, pasco os-8528A diode laser basic optics x2, instruction manual os-8533 polarization analy	
1E	x6 vernier ph x6 vernier st x1 vernier radiation monitor vrm-btd see www.vernier.com/manuals/vrm-btd & www.vernier.com/st	
1F	x6 vernier du x5 vernier current probe dcp-bta see www.vernier.com/manuals/dcp-bta & www.vernier.com/start/dcp-bta	
1G	x4 vernier motion detector MD-BTD; x1 Vernier time-of-flight pad tof-vpl see www.vernier.com/manuals/tof-vpl & www.vernie	
1H	serial adaptor for MAC unopened	
2E	tuning forks, bell, wood, stopper	
2F	ring/disk moment of inertia demo; ring & ball heat expansion demo; x2 lenz's law demo (copper tubes + magnetizism and unm	
2G	x2 seismic accelerator (supernova demo); arbor sccientific vertical acceleration demo P3-3520; arbor scientific friction rod kit p6	
2H	x2 indoor scoccer hovercraft (for conservation of momentum)	
1/2/3/4AA	x6 pasco OS-8500	
3A/4A	x2 pasco me-9215A photogate timer + acc; documents-handouts(throw away?)	
3B/4B	x6 photogate timer systems - need to further characterize	
3C/4C	many sets of weights (small), 4x hangers for heavy weights, heavy weight	
3D/4D	x3 motors, x4 centripetal force apparatus	
3E	Stop watches x 5	
3E	x3 box ME-9125B, x5 stop watches	
3F	x3 hovercraft kits (there were 10 - not very good); desktop spectroscopy kit/public lab.org,	
3G	balls, 7 tennis balls, 1 wood, 1 cardboard, 6 styrofoam, fishing weights (14 0.5oz, 4 4oz)	
3H	Extension cords 2X25, power strips 4x6	
4E	x3 Pasco ME-9207B free fall adapter	
4F	pasco PS-21(pasco PS-2103A motion sensor, Pasco PS-2120 rotary motion sensor, Pasco PS-2100A USB link x2, Pasco PS-2136 3	
4G	spring scale (20N, 10N, 5N, 2N, 1N - ME9513,9512,9511,9510,9509; arbor scientific 01-6970 spring scale set (2.5N, 5N, 10N, 20	
4H	various springs - x5 Pasco SE-8749 (3 of 3 types 6323-050,051,052; x2 Pasco ME-9835 (4 each 2 sizes); PASCO ME-6842 (2 each	
5A/6A	cardboard	
5AA	empty	
5B/6B	kwik-set lab chronometer, #1405 timer lab live instruments, science 1st gyroscope demo, x4 microscopes	
5C/6C	x3 aquarium lights (incandenscent bulbs)	
5D/6D	x3 ballistic pendulums, x3 (alumium beaker+foam+pingpong ball each), motorized (broken)planesphere; x2(more) ballistic pend	
5E	2 bunson burners, screens,, lead? Al shives, stopper	
5F	x5 halls carriage 095-28300	

5G	rubber bands various widths, various springs, paper clips	
5G	rubber bands + springs	
5H	wave demo box(long spring, slinky, string, 1 slink + 1 overstretched slinky);	
5H	2 slinkies	
6AA	measuring pi-lab box	
6E	ballasitc pendulum stuff	
6F	many ring standoffs for holding objects above bunson burners	x3 3-point stands
6G	pasco pulleys	
6H	x4 Cecno AP Physics Lab 13 Waves on a string	
11/12AA	x4 Pasco CI-6453; bundle std physics 750	
11/12B	ST-150 nuclear lab station; x2 triple balance scale + 2 pans; 1x 500 ml bulb tube glass container	
11/12C	x23 galvometers - various	
11/12D	1 light pipe (x2 decade ca x6 eisco conc extech capacitance deade box model 380405 50VDC 50pF internal - 20 different values - 1	
11A/12A	x4 simpson digital multimeter model 464; stuff for radioactivity lab (guess); lamp	
11AA to 16AA	need ladder to access	
11E	1box with small transformer	
11F	3 plastic boxes no tops	
11G	empty	
11H	x3 action kit + manuals	
12E	x8 inductor panels containing spool of various size wire & wire materials	
12F	x9 central scientific com (cenco) # 79586; x2 static field probes	
12G	Pasco conductive paper; x2 silver conductive ink	
12H	x13 cenco static conductive probes	
13/14A	x3 ? Oscilloscope	
13/14AA	x2 Pasco SE-7997 intro g-m sys 2001 see pack list & manual	
13/14B	x1 oscilloscope; x4 cenco physics oscillator amplifier CP36891-00	
13/14C	x2 0.5 meter dia solenoids 1 configures with led diodes (opposite polarity) showing lenz's law; x2 BK precesion function generato	
13/14D	x6 hickok res MCP lab electronics resistance decade box (1,10,100, 1k, 10k, 100k) & instruction manual	
13E	various carbon electrodes	
13F	empty	
13G	empty	
13H	empty	
14E	empty	
14F	empty	
14G	x1 schneider/kreuznach vario prolux mc 3.5/70-120 code 37482; x1 scope card 220 - dual channel pc board digital storage oscillo	
15/16A	carosell projector + slide tray; 1x unopened box ML810 8902020023	
15/16AA	empty	
15/16B	2x interferometer pasco + cases; 2x cenco x1 double slits, x1 multiple slits	
15/16C	pasco h/e experiment 1 complete; 1 missing mercury tube (upstairs); 1 interferometer heavy	
15/16D	magnetic field dip x1; x1 compass inside solenoid cenco; 3x eisco magnetic needle inclination (cat no ph0832N) (1 needs adjustm	
15E	Nicholl radiation disk set box only has plastic tuning fork looking object	
15F	x8 mirrors; x2 pasco os-8516A ray optics/basic optics	
15G	pasco x3 OS-8523 slit assory for 8515?; x1 OS-8515 instructor manual	
15H	x3 geiger supplies Ealing; x3 sensor mayco SB-875-7 compton (ID 11538, 35, 34)	
16E	various gratings	
16F	various prisms, blocks, fresnel grating	
16G	optic lenses, newtons rings	
16H	optics	
21A	empty	
21B	empty	
21C	empty	
21E	2x Pasco ME-9259A laser switch; C1-6870C data studio disks	
21F	x2 Global Specialities GSK187 stepper motor chopper drive; x2 Global Special GK804 - dc motor speed control kit	
21G	empty	
21H	empty	
22A	empty	
22B	empty	
22C	empty	
22E	?	
23A	arbor scientific - ballistic car with magnetic release	
23B	empty	
23C	radiation desk set - nicholl education cp33888-00; 2x metrologic neon laser; pasco diod laser model os-8525A	
25A	empty	
25B	empty	
25C	empty	
26 table	gallileoscope parts & box	
26A	empty	
26B	1x apparatus showing difference between wet & dry bulb thermometry - one rotates the vane	
26C	many sheets paper, glossy one side-wax paper made by C link	
26E	Vugraph machine	
27/28F	science workshop 750, x2 interface model C1-7500, SCSI card 2906, science workshop teachers guide	
27/28G	nothing	
27/28H	old style geiger counter plus head phones	
2728 table	x2 Pasco C1-6453 bundle std physics 750	
27A	books	
27B	books	

27C	books	
27E	Pasco power amp model C1-6552A; x10 arbor double pole/double throw; x10 arbor single pole/double throw	many square plastic cup
28A	books	
28B	books	
28C	books	
28E	battery holders, switches 16x Pasco SE-8799 series/parallel battery holder	
29/30 table	sink	
29/30A	nothing	
29/30F	nothing	
29B	nothing	
29C	nothing	
30B	ice crusher	
30C	20Amp light and transformer	
31/32 E	x2 electrostatic generator	
31/32 table	toolbox - mostly small stuff, bunson burner, 3 leg heating stand + sphere cu with valve; U-bend wire with Cu wire ends 2"x6" for induction; large	
31/32C	specific heat apparatus x4 WL 1961/1963A eelctroscopes, M3 interferometer - atomic labs	
33/34 table	120Vac solenoid + removable iron core + 3 rings; x3 hickok model 5058A variable ACDC power supply (0-125VAC 3.5A max, 0-400VDC 0.015A	
33E	x2 package 2986401 fuse assorted pk5 ward's science	
33/34E	disk drives	
33/34F	???	
33/34G	hardware manuals	
33/34H	nothing	
34A	HP 3311A function generator	
34B	Instek function generator FG-8015G	
35/36E	nothing	
35B	x6 Protoboards	
36A	3x Ealing counter/timer	
36B	3x instek function gnerator model FG 8015G	
36BB	3x 3311A HP function generator, 1x Ealing counter/timer	
36C	5x act 1 analogue circuit trainer + instructor manual	
37/38B	2x Extech stroboscope/tachometer 461830/461831; 1x atomic lab inc/cenco stroboscope cat # 74680, 1x atomic lab inc/cenco stroboscope cat #	
37/38F	wires, resistors	
37/38G	lab stands (3 legs), 1-3arm clamp, tubing, rods	
37/38H	cables	
37A	soldering irons x3	
37C	5x power supplies for act1 protoboards	
37E	aluminum shims, dice, aluminum can, headphones, 2 flat disks (mangebing exp)	
38C	10x multimeter BK toolkit 2703B	
38E	4 glass therometers, 6 steel thermometers, 1 glass stiring rod, 1 calipers(od), 3 historsis demo arms	
39/40A	2x BK precision 4011A 5MHz function generator	
39/40B	3x RSR electronics model 3010 regulated power supply (0-17V +/- 1A) (5V 3A)	
39/40C	4x Eisco EPR 1323D regulated power supply (PS: +/- 0-20V, 0-0.5A; 1x Elenco precision battery eliminator model XP-100	
41/42A	3 boxes fill strips chemistry - throw away?	
41/42B	pens pencils chalk scissors string, 2 electronics manuals (todays electronics E&L, ACT-1 again by E&L)	
41/42C	1983 physics 10 ideas	
41/42E	box of cables (no connectors) many aluminum rods, 3 experiment stand bases (2x tripod, 5x wedge-shaped), 2 boxes of hoses (vacume), 1 box o	
43/44A	x2 nerf doppler balls; mirage model 2000 (double concave mirros nested opposite each other, hole in top one); x2 sunset eggs	
43/44B	plastic protestive googles - 4 types - 16	
43/44C	spool of wire labels for BEHR FreeFall, x2 corning pH electrodes cat # 34106-568 (476024)	
43/44F	clamps various - note drawer is broken	
43/44G	XGA computer monitor stuff. Cables (cut/bare) power cables	
43/44H	TV remotes; smart panel?	
43E	check?	
44E	rubber "string" hoses vacume?	
45/46A	empty	
45/46B	?	
45/46C	empty	
45/46E	salt solution	
47/48A	empty	
47/48B	empty	
47/48C	empty	
47/48E	x2 bicycle gyros, x2 spectrometers in wooden boxes, x1 door?, x1 cenco ballistic pendulum stand	
47F	empty	
47G	empty	
47H	stoppers (check)	
49/50B	x3 3-arm balance scales	
49/50C	jar of screws, jar of iron filings, jar of oil, 1 box of magnets (strong) for making motors, spool of magnet wire, 6 sets of bar magnets, coils of ma	
50E	junk	
50F	junk	
50G	empty	
50H	empty	
51/52A	volume 1&2 science workshop student manual, volume 3 science workshop teaching guide	
51/52E	cardboard & empty boxes	
51B	sieve	
52B	interesting glassware?	

Explain the immediate (1-2 years) needs related to facilities and equipment. Provide a cost estimate for each need and explain how it will help the program better meet its goals.

Recommendations more associated with equipment

- Continue building a thorough inventory of the rooms and equipment. (200 per year - 2018 estimate)
- Promote the development of demonstrations and experiments using simple tools available to students (like double pinhole telescope). We want to coordinate with other departments such as Welding and utilize their expertise (for example, Helium (He) for weather balloons and double pinhole telescope), otherwise we need to develop that expertise and obtain the necessary tools locally. (1000 per year - 2018 estimate)
- Get control of the lights in the neighborhood to allow the use of the telescopes
- Get six (6) 6-inch Schmidt-Cassegrain computer-controlled (GoTo) telescopes. GoTos are needed because of our significant light-pollution problem. (5200-2018 cost includes accessories).
- Get four (4) solar telescopes for astronomical observations for daytime astronomy classes. (2200-2018 cost includes accessories)
- Get six (6) sets of Silicon PMT hardware to initially build six detectors (for honors students) and then develop cosmic-ray experiments to use for Physics 252 (or 103) and Physics 2B.
- Get weather-balloon hardware to launch one weather-balloon per year (1000 per year - 2018 estimate)
- Get a Cavendish (3400), e/m (4649), Millikan (2299) setup for demonstrations - eg., from Pasco
- Get a rotating platform (50) for moment-of-inertia and Foucault demonstration
- Get a ladder (250-2018 estimate)

Explain the long-range (2-4+ years) needs related to facilities and equipment. Provide a cost estimate for each need and explain how it will help the program better meet its goals.

Any items that we can't get in the 1-2 year time frame, we gladly want in the 2-4 year time frame.

List any related recommendations.

Recommendations more associated with equipment

- Continue building a thorough inventory of the rooms and equipment.
- Promote the development of demonstrations and experiments using simple tools available to students (like double pinhole telescope).We want to coordinate with other departments such as Welding and utilize their expertise (for example, Helium (He) for weather balloons and double pinhole telescope), otherwise we need to develop that expertise and obtain the necessary tools locally.
- Get control of the lights in the neighborhood to allow the use of the telescopes.
- Get six (6) 6-inch Schmidt-Cassegrain computer-controlled (GoTo) telescopes because of our significant light-pollution problem.
- Get four (4) solar telescopes for astronomical observations for daytime astronomy classes.
- Get six (6) sets of Silicon PMT hardware to initially build six detectors (for honors students) and then develop cosmic-ray experiments to use for Physics 1D and Physics 2B.
- Get weather-balloon hardware to launch one weather-balloon per year.

Academic Program Review: (7) Technology and Software First Submission: Version by **Schwitkis, Kent** on **12/05/2022 21:25**

Describe and assess the adequacy and currency of the technology and software used by the program.

At present, we have 10-laptops for laboratory and class use. These laptops run our laboratory equipment, recording sensor data, and doing data manipulation. They are also used to run physics and astronomy simulations. We need at least to double this resource to allow for minimal learning experience to our students.

We have been using software on these laptops that is free, or are part of the laboratory equipment we are utilizing.

Explain the immediate (1-2 years) needs related to technology and software. Provide a cost estimate for each need and explain how it will help the program better meet its goals.

- There is a set of simulations (CLEA) though that we cannot use. They use outdated Windows operating system, but the simulation topics fit our Astronomy Lab needs. We could make use of the old computers from other departments on campus. (200 - 2018 estimate)
- Get 20 more laptops for laboratory and class use. (12000 - 2018 estimate)

Explain the long-range (2-4+ years) needs related to technology and software. Provide a cost estimate for each need and explain how it will help the program better meet its goals.
No Value

List any related recommendations.
Recommendations.

1. Obtain another 20 laptops
2. Study whether to develop or purchase of a CLEA-like simulation software

Academic Program Review: (8) Staffing First Submission: Version by **Schwitkis, Kent** on **12/05/2022 21:25**

Describe the program's current staffing, including faculty, administration, and classified staff.
In the spring of 2014, the Physics/Astronomy department added a tenure-track faculty member bringing the number of total full-time tenure-track faculty to one. The previous tenured faculty member retired in the fall of 2013. There is a total of five or six adjunct faculty members serving Physics/Astronomy each semester. The full-time faculty member was a recent and long-term employee in aerospace. He has been encouraged to relate his experiences to our students.

Given the importance on problem-solving, we have searched out for instructors and helpers that have industrial in addition to academic experiences. We have been successful in this regard. We have 3 instructors that have been in aerospace for approximately 60 years.

In 2018, given the growth of the department in the past few years, we suggest the addition of a second physics/astronomy full-time instructor. This addition will allow the continued growth in the program, not only by mitigating our dependence upon part-time/casual instructors, but by the obvious synergy between the full-time instructors. Unfortunately, COVID "cut our legs out". The need for a second full-time instructor is not needed at present. The current feeling is like we're starting over again.

There are continued developments in Physics and Astronomy, but in regards to the actual courses we teach, the topics are rather stable. The biggest changes are occurring in the field of Physics and Astronomical Education Research, which is being driven by our increased understanding of brain chemistry and neurobiology. Examples of such documents can be found in the National Academy of Science, Engineering, and Medicine documents "Reaching Students: What Research Says About Effective Instruction in Undergraduate Science and Engineering" and "Discipline-Based Education Research: Understanding and Improving Learning in Undergraduate Science and Engineering (2012)"[3].

There is one physical science technician responsible for assisting all physical science faculty, including the Chemistry, Physics, Astronomy, and Earth Science departments. With the increase in the courses being offered and the demand for the preparation of the materials and demonstrations for the upcoming courses the workload of the lab technician will increase. We believe a full-time lab technician will be needed given the developing course demand.

There is no direct supervisor for the lab technician. The faculty and lab technician generally work well together, but there is no line of authority if there is a question regarding performance. The technician reports directly to the dean. This technician should be under direct supervision by someone with knowledge of day-to-day operations and performance.

There are 3 technicians associated with the Natural Sciences. It would be nice have to them cross-trained in the various disciplines. Naturally, scheduling could be worked out and distributed to the faculty members.

Explain and justify the program's staffing needs in the immediate (1-2 years) and long-term (2-4+ years). Provide cost estimates and explain how the position/s will help the program better meet its goals.
No Value

List any related recommendations.
Recommendations.

- Hire a second full-time physics/astronomy instructor
- Cross-coordination between Natural Science technicians and published schedule.
- Have the tenured faculty member attend SCAAPT and AAPT conferences, yearly if possible.
- Have the adjunct members also attend SCAAPT and AAPT conferences, when possible.
- Have the tenured faculty member attend a meeting of Astronomical Society of the Pacific or the American Astronomical Society.
- Develop a community network that includes local high schools and 4-year colleges, and industry.
- Develop a formal connection with local industry, an informal one exists at present.

Academic Program Review: (9) Direction and Vision First Submission: Version by **Schwitkis, Kent** on **12/05/2022 21:25**

Describe relevant changes within the academic field/industry. How will these changes impact the program in the next four years?
There continue to be changes in the academic field and industry that directly point to the need of creating more practitioners in the field. Basically, academia and industry need more scientists and engineers. The latest example are the launching of the Artemis (in Nov 2022), and the "photograph" of the M87 in 2019 (and the SagA in 2020). There has been continued improvements with "our" understanding of Qubits and Superconductivity. Again, once our understanding of the basic science is made, applications will be made which require engineering.

In regards to the field of teaching, there are always changes. We have to maintain our currency with better ways of communicating with our students and understanding their desires, capabilities, needs, and limitations.

Explain the direction and vision of the program and how you plan to achieve it.
Our vision is to continue to develop our departments equipment and faculty. In addition, we want the community to know about us, through lecture series and astronomical star parties. We want the high school students in the neighborhood to know we are an institution that knows what industry and higher institutions want.

We want to develop more formal contacts with local industry (Boeing, SpaceX, and Aerospace), research institutions like JPL, and local colleges (CSUDH, UCLA) to facilitate our students next steps (through internships). We already have an informal connection with Boeing, Northrup, Raytheon, and CSUDH-Physics.

The program is trying to increase its footprint upon the community. The weather-balloon project was a missed advertising opportunity. We did participate as judges at a local science fair at Dominguez High School. There is still the desire to conduct an astronomy lecture/star-party series on campus, and to increase our facilitation of physics and astronomy learning in the local high schools.

The Physics/Astronomy faculty at Compton College engages students to actively participate in their learning by using a variety of instructional methods and services to promote student success and create a positive learning environment, as well as a sense of community. Our full-time faculty has completed the Faculty Inquiry Partnership Program (FIPP), On-Course Training, and regularly attends the American Association of Physics Teachers meetings. At the AAPT meetings, we hear recommendations from industry leaders (e.g., Aerospace Corp), about what skill sets are necessary for an incoming employee.

Physics Education Research is discussed with the adjuncts to improve educational effectiveness. For example, students participate in peer teaching, group presentations, and class activities; we try to minimize teacher-speaking times. The laboratory experiments are designed to be performed in pairs (or groups) as well as individually for the students to learn a sense of belonging and most importantly to learn how to work collaboratively. Examples of these activities are highlighted by participation in the yearly Natural Science Symposium and the launching of a fully-telemetered weather-balloon from the campus in June 2018. This year, the program had eight speakers at the college's science symposium, while the weather balloon had FAA approval, ascended to an altitude of 25 km, and was recovered near Victorville, some 120 miles distant.

We missed two years with our annual weather-balloon project and launch. Still, we are excited about the launch in June of 2023. We already have 4 students specifically working on the HAB. During the past-two years, we discovered that we could run projects in a virtual-synchronous environment. These projects revolved around Arduinos and Robots.

List any related recommendations.
Recommendations

- Develop and formalize the network between our department and our communities' high schools, industry, and 4-year college collaborators.
- Continue the summer-camps for high school students
- Advertise our accomplishments
- Maintain and increase the opportunities that we offer our students (for example the Compton Comet, HAB, Make-It-Happen)

Academic Program Review: (10) Prioritized Recommendations First Submission: Version by **Schwitkis, Kent** on **12/05/2022 21:25**

Provide a single, prioritized list of recommendations and needs for your program/department (drawn from your recommendations in sections 2-8). Include cost estimates and list the college strategic initiative that supports each recommendation.

Recommendations	Yr Cost Estimate	Strategic Initiatives
Control the outdoor lighting	unknown	1, 2, 3, 4
Ladder to access upper cabinets safely	250	3, 4
Lab manuals for Physics 120/122, 150/152/250/252, and 101/102/103	1000	1, 2, 4
Obtain six (6) 6" Schmitt-Cassegrain GoTo telescopes +accessories	5200	1, 2, 3, 4
Obtain four (4) Solar telescopes + accessories	2200	1, 2, 3, 4
Obtain six (6) silicon PMT assemblies	1000	1, 3, 4
Obtain hardware to launch 1 weather balloon per year	1000	1, 3, 4, 5
Obtain another 20 laptops	12000	1, 2, 3, 4
Convert courses to allow Hybrid flexibility	1000	1, 2, 3
Equipment inventory maintenance	200	3, 4
Maintain, repair, and upgrade equipment	5000	3, 4
Obtain added demonstration equipment (e.g., Cavendish, e/m, Millikan)	10000	1, 2, 3, 4
Design and build DIY experiments for student use	1000	1, 2, 3, 4
Study whether to develop or purchase of a CLEA-like simulation software	100	1, 2, 3, 4
Have the tenured facility member attend SCAAPT and AAPT conferences, yearly if possible.	1800	1, 4
Have the adjunct members also attend SCAAPT and AAPT conferences.	1800	1, 4
Have the tenured faculty member attend a meeting of Astronomical Society of the Pacific or the American Astronomical Society.	1800	1, 4
Develop a community network that includes local high schools and 4-year colleges, and industry.	unknown	1, 4, 5
Develop a formal connection with local industry, from informal existent one at present.	unknown	1, 4
Cross-coordination between Natural Science technicians and published schedule.	200	4