

Program Review Summary Page

For Instructional Programs

Program or Area(s) of Study under Review: Physics and Astronomy

Term/Year of Review: Fall 2020

Summary of Program Review:

A. Major Findings

1. Strengths:

- Physics for pre-health students shows **increased** enrollment.
- Productivity **increase** starting in 2018-2019.
- Over the past three years, the retention rate for the Physics Program was **significantly higher** than the rate at the institutional level.
- Over the past three years, the successful course completion rate for the Physics Program was **significantly higher** than the rate at the institutional level.
- Successful course completion rates were **higher** than the rates at the institutional level among all three studied equity groups. The differences among Hispanic and First-Generation students were statistically significant.
- The number of AS-T degrees conferred by the Physics Program **increased by 140%** between 2017-2018 and 2019-2020
- **100%** of physics and astronomy courses have **SLO** measurement in 2016-2020
- High Fill rates for ASTR 110 when compared to Institutional level.

2. Areas for Improvement:

General education: Continue monitoring success of new adjunct faculty and fill rates. Consider if appropriate number of sections are being offered.

Physics laptops and computer lab need refreshment.

3. Projected Program Growth, Stability, or Viability:

The physics program is stable. For astronomy, the program is stable; however, there is some room for growth if we reach out to students.

B. New Objectives/Goals:

Continue asking for laptop/computer refresh

Investigate whether a one credit physics calculus supplement would be beneficial addition to General Physics program.

Consider adoption of more open resources for equity purposes.

Bring back Observation Nights to increase visibility of Astronomy. This activity would also serve as outreach for Astronomy and other related programs.

This report covers the following program, degrees, certificates, area(s) of study, and courses (based on the Taxonomy of Programs on file with the Office of Academic Affairs):

Program	Physics		
Area of Study	Calculus-based	General Physics	General Education
Degrees/Certificates	Physics: AS-T		
Courses	PHYS-140	PHYS-120	PHYS-110
	PHYS-240	PHYS-121	PHYS-111
	PHYS-241	PHYS-199	
	PHYS-250		

Taxonomy of Programs, July 2020

Program	Astronomy
Courses	ASTR-110
	ASTR-111

Taxonomy of Programs, July 2020

I. PROGRAM DATA

A. Demand

1. Headcount and Enrollment
For Physics:

	2017-2018	2018-2019	2019-2020	Change over 3-Year Period
Headcount				
Within the Program	372	344	283	-23.9%
Across the Institution	8,843	8,176	8,181	-7.5%
Enrollments				
Calculus-Based	252	239	209	-17.1%
PHYS-140	98	88	74	-24.5%
PHYS-240	82	80	69	-15.9%
PHYS-241	60	65	66	10.0%
PHYS-250	12	6	--	-100%
General Education	201	170	127	-36.8%
PHYS-110	161	131	94	-41.6%
PHYS-111	40	39	33	-17.5%
General Physics	41	49	55	34.1%
PHYS-120	26	32	35	34.6%
PHYS-121	15	17	20	33.3%
Within the Program	494	458	391	-20.9%
Across the Institution	36,115	32,545	33,102	-8.3%

Source: SQL Enrollment Files

RPIE Analysis: The number of students enrolled (headcount) in the Physics Program decreased by 23.9% over the past three years, while headcount across the institution decreased by 7.5%. Similarly, enrollment within the Physics Program decreased by 20.9%, while enrollment across the institution decreased by 8.3%.

Enrollment in the following courses and areas of study changed by more than 10% ($\pm 10\%$) between 2017-2018 and 2019-2020:

Courses and area of study with enrollment increases:

- PHYS-120 (34.6%)
- General Physics (34.1%)
- PHYS-121 (33.3%)

Courses and areas of study with enrollment decrease:

- PHYS-250 (-100%)
- PHYS-110 (-41.6%)
- General Education (-36.8%)
- PHYS-140 (-24.5%)
- PHYS-111 (-17.5%)
- Calculus-Based (-17.1%)
- PHYS-240 (-15.9%)

For PHYS-250, which was offered in two of the past three years, enrollments decreased by 50% between 2017-2018 and 2018-2019.

Program Reflection:

Enrollment and class size are linked by the limitations of lab sizes, so they are discussed concurrently in item 2, below.

For Astronomy:

	2017-2018	2018-2019	2019-2020	Change over 3-Year Period
Headcount				
Within the Program	203	194	189	-6.9%
Across the Institution	8,843	8,176	8,181	-7.5%
Enrollments				
ASTR-110	157	194	189	20.4%
ASTR-111	47	--	--	-100%
Within the Program	204	194	189	-7.4%
Across the Institution	36,115	32,545	33,102	-8.3%
<i>Source: SQL Enrollment Files</i>				

RPIE Analysis: The number of students enrolled (headcount) in the Astronomy Program decreased by 6.9% over the past three years, while headcount across the institution decreased by 7.5%. Similarly, enrollment within the Astronomy Program decreased by 7.4%, while enrollment across the institution decreased by 8.3%.

Enrollment in the following courses changed by more than 10% ($\pm 10\%$) between 2017-2018 and 2019-2020:

Course with enrollment increase:

- ASTR-110 (20.4%)*

Course with enrollment decrease:

- ASTR-111 (-100%)*

Program Reflection:

The number of students enrolled in ASTR 110 has increased by 20.4% over the past three years while at the institution level the enrollment has decreased by 7.5% over the same period of time. The increases in ASTR 110 enrollment is probably due to the fact that we don't offer ASTR 111 anymore since the 2017-2018 academic year. We decided not to offer ASTR 111 because it was a customized class of practical astronomy. This class was developed by one of our faculty who retired two years ago. Hence, when he retired, we decided not to offer ASTR 111 because we did not have a suitable instructor to continue teaching it. The increase in enrollment in ASTR 110 has not been enough to overcome the elimination of ASTR 111. However, we can

probably bring back Observation Nights to outreach to students interested in Astronomy. Public Observation Nights ceased two years ago when John Charlesworth retired.

2. Average Class Size For Physics:

	2017-2018		2018-2019		2019-2020		Three-Year	
	Sections	Average Size	Sections	Average Size	Sections	Average Size	Average Section Size	Trend
Calculus-Based	11	22.9	11	21.7	9	23.2	22.6	1.4%
PHYS-140	4	24.5	4	22.0	4	18.5	21.7	-24.5%
PHYS-240	3	27.3	3	26.7	3	23.0	25.7	-15.9%
PHYS-241	3	20.0	3	21.7	2	33.0	23.9	65.0%
PHYS-250	1	12.0	1	6.0	--	--	9.0	--
General Education	7	28.7	6	28.3	6	21.2	26.2	-26.3%
PHYS-110	5	32.2	4	32.8	4	23.5	29.7	-27.0%
PHYS-111	2	20.0	2	19.5	2	16.5	18.7	-17.5%
General Physics	3	13.7	3	16.3	3	18.3	16.1	34.1%
PHYS-120	2	13.0	2	16.0	2	17.5	15.5	34.6%
PHYS-121	1	15.0	1	17.0	1	20.0	17.3	33.3%
Program Average*	21	23.5	20	22.9	18	21.7	22.8	-7.7%
Institutional Average*	1,406	25.7	1,313	24.8	1,348	24.6	25.0	-4.3%

Source: SQL Enrollment and Course Sections Files

Average Section Size across the three-year period for courses, and both within academic years and across the three-year period for the program and institutional levels is calculated as:

$$\frac{\text{Total \# Enrollments.}}{\text{Total \# Sections}}$$

It is not the average of the three annual averages.

***RPIE Analysis:** Over the past three years, the Physics Program has claimed an average of 22.8 students per section. The average class size in the program has been lower than the average class size of 25.0 students per section across the institution during this period. Average class size in the program decreased by 7.7% between 2017-2018 and 2019-2020. Average class size at the institutional level decreased by 4.3% over the same period.*

Average class size in the following courses and areas of study changed by more than 10% ($\pm 10\%$) between 2017-2018 and 2019-2020:

Courses and area of study with increases in average class size:

- o PHYS-241 (65.0%)*
- o PHYS-120 (34.6%)*
- o General Physics (34.1%)*
- o PHYS-121 (33.3%)*

Courses and area of study with decreases in average class size:

- o PHYS-110 (-27.0%)*
- o General Education (-26.3%)*
- o PHYS-140 (-24.5%)*
- o PHYS-111 (-17.5%)*
- o PHYS-240 (-15.9%)*

Program Reflection:

General Physics (PHYS 120/121) is physics for pre-health students. This area is expanding in headcount and class size, and we can consider catering more toward this population. For example, we can investigate a potential calculus supplement to this track (some community colleges offer this, but NVC has traditionally not offered this). The program is not yet at the size where it makes sense to add more sections of 120/121.

General education (PHYS 110 and 111 lab):

PHYS 110: We dropped one section of PHYS 110 in 2018, so that is some of the decrease in the headcount data. We also saw decrease in fill rates in the year 2019-2020. The department will continue to look at fill rates and consider if further sections should be dropped. We have experienced faculty turn over in this program during the review period. We have new faculty who are now consistently taking these sections. There is the opportunity for program stability and improvement with repeat faculty taking stewardship of these courses. We will continue to monitor fill rates to determine if we are offering the appropriate number of sections.

PHYS 111: had a drop in enrollment in 2019-2020 which corresponds to the physics 110 decline. This is understandable since most students taking PHYS 111 take PHYS 110 concurrently. I was interested in how the PHYS 111 section size compares to the 110 section size and tabulated it below by calculating: $(111 \text{ ave size}) / (110 \text{ ave size}) * 100\%$. In the last year of downturn in 110 enrollments (2019-2020), the ratio of students taking lab increased. Based on that (and small statistics) we see no need to decrease the 111 offerings.

	2017-2018	2018-2019	2019-2020
PHYS 111 to 110 student ratio	62%	59%	70%

Calculus-based (PHYS 140/240/241):

A steady decline of physics 140 enrollment over three years affects all courses in the sequence, however we observe a slight gain in PHYS 241 indicating better retention of students in that track **OR** increased number of students needing to take all three semesters. The department will continue to monitor PHYS 241 enrollment to determine if opening additional sections becomes appropriate. Likewise, we will monitor the fill rates of PHYS 140 which declined from 2017-2018 to 2018-2019. However, the average class size is almost 22 students, which is an appropriate number of students for each lab section. The lab room seats a max of 24 students comfortably (4 students per table).

PHYS 250 will unfortunately not continue at NVC for two reasons:

1. It was grant-funded and expensive to run without grant support

2. Credit transfer to UC as a course for majors was not approved, likely because it was too practical and not theoretical. Possibly for this reason, it had low enrollments.

For Astronomy:

	2017-2018		2018-2019		2019-2020		Three-Year	
	Sections	Average Size	Sections	Average Size	Sections	Average Size	Average Section Size	Trend
ASTR-110	4	39.3	5	38.8	5	37.8	38.6	-3.7%
ASTR-111	1	47	--	--	--	--	47.0	--
Program Average*	5	40.8	5	38.8	5	37.8	39.1	-7.4%
Institutional Average*	1,406	25.7	1,313	24.8	1,348	24.6	25.0	-4.3%

Source: SQL Enrollment and Course Sections Files

Average Section Size across the three-year period for courses, and both within academic years and across the three-year period for the program and institutional levels is calculated as:

$$\frac{\text{Total \# Enrollments}}{\text{Total \# Sections}}$$

It is not the average of the three annual averages.

RPIE Analysis:

Over the past three years, the Astronomy Program has claimed an average of 39.1 students per section. The average class size in the program has exceeded the average class size of 25.0 students per section across the institution during this period. Average class size in the program decreased by 7.4% between 2017-2018 and 2019-2020. Average class size at the institutional level decreased by .3% over the same period.

There were no courses with an average class size that changed by more than 10% ($\pm 10\%$) between 2017-2018 and 2019-2020.

Program Reflection:

The average class size for ASTR 110 over the past three years is 38.6. This is considerably larger than the average class size at the institutional level, 25.0. The 3.7% decrease in average class/section size for ASTR 110 is probably due to the fact that we have increased the number of sections from 4 in 2017-2018 to 5 since 2018-2019.

3. Fill Rate and Productivity

For Physics:

	Fill Rate*		
	Enrollments*	Capacity	Fill Rate
2017-2018	494	426	116%
2018-2019	458	426	108%
2019-2020	391	338	116%
Three-Year Program Total	1,343	1,190	113%

Institutional Level	91,739	112,746	81.4%
Productivity*			
	FTEs	FTEF	Productivity
2017-2018	77.4	9.4	8.2
2018-2019	77.9	6.9	11.3
2019-2020	75.6	6.7	11.3
Three-Year Program Total	230.9	23.0	10.0
<i>Source: SQL Enrollment and Course Sections Files</i>			

RPIE Analysis: Fill rates within the Physics Program tend to be higher than the fill rates at the institutional level. [Compare program-level rate of 113% to institution-level rate of 81.4% over the past three years.] Between 2017-2018 and 2018-2019, enrollment decreased and capacity remained stable, resulting in a decrease in fill rate. Between 2018-2019 and 2019-2020, both enrollment and capacity decreased, resulting in an increase in fill rate (due to the higher rate of decrease in capacity).

Productivity increased from 8.2 to 11.3 over the three-year period. [Productivity has not been calculated at the institutional level.] The three-year program productivity of 10.0 is lower than the target level of 17.5, which reflects 1 FTEF (full-time equivalent faculty) accounting for 17.5 FTEs (full-time equivalent students) across the academic year. (This target reflects 525 weekly student contact hours for one full-time student across the academic year.)

**Note: Fill rates and productivity reported in the table do not include four Physics section offerings for summer terms over the past three years. As a result, the enrollment figures reported here might differ from those reported in Section I.A.1.*

Program Reflection:

The FTEF calculation for physics will likely always be low, due to class size limits on lab sections and our lab hours not being reflected in the number of units. For example, a standard physics course is 3 hours lecture, one hour of problem solving and 3 hours of lab. Although this is 7 hours of faculty time, it is reflected as 4 credits. Years ago, we investigated assigning 5 credits for this structure of class, but it was rejected by advice from counseling as unit bloat. Faculty in this area have more contact hours than the typical instructor, I believe reflecting a consistently low FTEF.

We did successfully shed some lower enrolled sections resulting in higher productivity beginning 2018.

For Astronomy:

Fill Rate*			
	Enrollments*	Capacity	Fill Rate
2017-2018	204	180	113.3%
2018-2019	194	180	107.8%
2019-2020	189	180	105.0%
Three-Year Program Total	587	540	108.7%
Institutional Level	91,739	112,746	81.4%
Productivity*			
	FTES	FTEF	Productivity
2017-2018	18.5	0.9	20.6
2018-2019	17.3	0.9	19.2
2019-2020	15.8	0.8	19.8
Three-Year Program Total	51.6	2.6	19.8

Source: SQL Enrollment and Course Sections Files

RPIE Analysis: Fill rates within the Astronomy Program tend to be higher than the fill rate at the institutional level. [Compare program-level rate of 109% to institution-level rate of 81.4% over the past three years.] Between 2017-2018 and 2018-2019, enrollment decreased and capacity remained stable, resulting in a decrease in fill rate. Between 2018-2019 and 2019-2020, enrollment decreased slightly while capacity remained stable, resulting in a slight decrease in fill rate.

Productivity remained relatively consistent, ranging from 19.2 to 20.6 over the three-year period. [Productivity has not been calculated at the institutional level.] The three-year program productivity of 19.8 is higher than the target level of 17.5, which reflects 1 FTEF (full-time equivalent faculty) accounting for 17.5 FTES (full-time equivalent students) across the academic year. (This target reflects 525 weekly student contact hours for one full-time student across the academic year.)

**Note: Fill rates and productivity reported in the table do not include three section offerings for summer terms over the past three years. As a result, the enrollment figures reported here might differ from those reported in Section I.A.1.*

Program Reflection:

The fill rates for Astronomy is significantly higher, 108.7%, than at the Institutional Level, 81.4%. This indicates that our offerings of ASTR 110 are at appropriate days and times. Also, indicates that there is a demand for this course. With outreach we can increase the fill rates even more and possibly make a case for an additional section. However, finding an instructor for an additional section would be difficult.

4. Labor Market Demand

This section does not apply to the Physics Program, as it is not within the Career Technical Education Division.

B. Momentum

1. Retention and Successful Course Completion Rates

For Physics:

	Retention Rates (Across Three Years)			Successful Course Completion Rates (Across Three Years)		
Level	Rate	Course Rate vs. Program Rate		Rate	Course Rate vs. Program Rate	
		Above	Below		Above	Below
Calculus-Based	96.8%	X		94.2%	X	
PHYS-140	94.5%	--	--	88.5%	--	--
PHYS-240	98.7%	X		98.3%	X	
PHYS-241	97.4%	X		96.3%	X	
PHYS-250	100%	X		100%	X	
General Education	91.6%		X	82.7%		X
PHYS-110	91.4%		X	80.9%		X
PHYS-111	92.7%	--	--	89.0%	--	--
General Physics	85.4%		X	82.6%		X
PHYS-120	78.5%		X	75.3%		X
PHYS-121	98.0%	X		96.1%	X	
Program Level	93.7%			88.7%		
Institutional Level	90.5%			76.3%		
<p>Source: SQL Enrollment Files</p> <p>-- Indicates a value that is within 1% of the program-level rate.</p> <p>Bold italics denote a statistically significant difference between the course-level rate and the program-level rate.</p> <p>Bold denotes a statistically significant difference between the program-level rate and the institutional rate.</p> <p>Note: Spring 2020 grades of EW (Excused Withdrawal) are not included in the calculations of the three-year retention and successful course completion rates reported above. This approach reflects the standard recommended research practice of not including EWs in either the numerator or the denominator for these rates.</p>						

RPIE Analysis: Over the past three years, the retention rate for the Physics Program was significantly higher than the rate at the institutional level. The retention rates for the General Physics area of study and PHYS-120 were significantly lower than the program-level rate. The retention rates for the Calculus-Based area of study, PHYS-240, and PHYS-241 were significantly higher than the program-level rate. The retention rate for the Physics Program falls in the 68th percentile among program-level retention rates (across 59 instructional programs, over the past three years).

Over the past three years, the successful course completion rate for the Physics Program was significantly higher than the rate at the institutional level. The successful course completion rates for the General Education area of study, PHYS-110, the General Physics area of study, and PHYS-120 were significantly lower than the program-level rate. The successful course completion rates for the Calculus-Based area of study, PHYS-240, and PHYS-241 were significantly higher than the program-level rate. The successful course completion rate for the Physics Program falls in the 85th percentile among program-level successful course completion rates (across 59 instructional programs, over the past three years).

Over the past three years, the difference between retention and successful course completion at the program level (5%) was significantly lower than the difference at the institutional level (14.2%). This figure represents the proportion of non-passing grades assigned to students (i.e., grades of D, F, I, NP).

The following Physics Program course claimed differences (between retention and successful course completion) that exceeded 10%:

- PHYS-110 (10.5%)

Program Reflection:

Overall, we are proud that the data shows that the **retention** and **successful course completion** rates for the Physics Program are **significantly higher** than the rate at the institutional level.

Within the program, it is expected that the entry level courses in each track would have the lowest retention and completion rates. That would be PHYS 110, 120, and 140. Of these, PHYS 140 has the highest level of pre-requisite mathematics, so it is anticipated that it would fare better than the other entry courses.

We will continue to work to retain and support success of students particularly during their first semester. Practices employed by the department to accomplish this include:

- Referral to tutoring and other student services
- Practice exams
- In-class problem solving
- Use of Supplemental Instruction when available

For Astronomy:

Level	Retention Rates (Across Three Years)			Successful Course Completion Rates (Across Three Years)		
	Rate	Course Rate vs. Program Rate		Rate	Course Rate vs. Program Rate	
		Above	Below		Above	Below
ASTR-110	92.9%	X		78.4%	X	
ASTR-111	55.3%		X	36.2%		X
Program Level		89.8%			75.0%	

Institutional Level	90.5%	76.3%
<p><i>Source: SQL Enrollment Files</i></p> <p>-- Indicates a value that is within 1% of the program-level rate.</p> <p><i>Bold italics</i> denote a statistically significant difference between the course-level rate and the program-level rate.</p> <p>Bold denotes a statistically significant difference between the program-level rate and the institutional rate.</p> <p>Note: Spring 2020 grades of EW (Excused Withdrawal) are not included in the calculations of the three-year retention and successful course completion rates reported above. This approach reflects the standard recommended research practice of not including EWs in either the numerator or the denominator for these rates.</p>		

***RPIE Analysis:** Over the past three years, the retention rate for the Astronomy Program mirrored the rate at the institutional level. The retention rate for ASTR-111 was significantly lower than the program-level rate. The retention rate for ASTR-110 was significantly higher than the program-level rate. The retention rate for the Astronomy Program falls in the 29th percentile among program-level retention rates (across 59 instructional programs, over the past three years).*

Over the past three years, the successful course completion rate for the Astronomy Program mirrored the rate at the institutional level. The successful course completion rate for ASTR-111 was significantly lower than the program-level rate. The successful course completion rate for the Astronomy Program falls in the 39th percentile among program-level successful course completion rates (across 59 instructional programs, over the past three years).

Over the past three years, the difference between retention and successful course completion at the program level (14.8%) was consistent with the difference at the institutional level (14.2%). This figure represents the proportion of non-passing grades assigned to students (i.e., grades of D, F, I, NP).

The following Astronomy Program courses claimed differences (between retention and successful course completion) that exceeded 10%:

- ASTR-111 (19.1%)
- ASTR-110 (14.5%)

Program Reflection:

While the Retention Rates and Successful Course Completion Rates for Astronomy over the past three years closely aligns with the institution level corresponding rates, there are opportunities to increase the Successful Course Completion Rate for ASTR 110 (currently at 78.4%) and bring it closer to the Retention Rate (currently at 92.9%). This can be accomplished by directing students to campus resources such a STEM/MESA Center and Office Hours of Full-Time faculty.

2. Student Equity For Physics:

	Retention Rates (Across Three Years)		Successful Course Completion Rates (Across Three Years)	
	Program Level	Institution Level	Program Level	Institution Level
Black/African American	87.5%	86.4%	79.2%	65.3%
Hispanic			86.1%	73.9%
First Generation			86.3%	75.0%

Source: SQL Enrollment Files

Bold italics denote a statistically significant difference between rates at the program and institutional levels, with the lower of the two rates in **bold italics**.

Shaded cells pertaining to retention rates indicate that statistically significant differences for those groups were not found at the institutional level.

Note: Spring 2020 grades of EW (Excused Withdrawal) are not included in the calculations of the three-year retention and successful course completion rates reported above. This approach reflects the standard recommended research practice of not including EWs in either the numerator or the denominator for these rates.

RPIE Analysis: This analysis of student equity focuses on the three demographic groups with significantly lower retention and/or successful course completion rates found at the institutional level (vs. the corresponding rates among all other groups of students, combined) over the past three years. Tests of statistical significance were conducted to compare program-level and institution-level rates among the three groups listed above.

Within the Physics Program, the retention rate among Black/African American students was higher than the rate at the institutional level. (The difference was not statistically significant.)

Within the Physics Program, the successful course completion rates were higher than the rates at the institutional level among all three groups. The differences among Hispanic and First-Generation students were statistically significant.

These patterns reflect the findings from the comparison of retention and successful course completion at the program vs. institutional level, where the program-level rates for retention and successful course completion exceeded the corresponding institution-level rates (See Section I.B.1 above).

Program Reflection:

We are encouraged to view the relative success in course completion rates for Hispanic and First-Generation students. Possible reasons for that success include mentorship by our bilingual and Hispanic faculty and proximity to the MESA center which has been a wonderful support to STEM students.

For Astronomy:

	Retention Rates (Across Three Years)		Successful Course Completion Rates (Across Three Years)	
	Program Level	Institution Level	Program Level	Institution Level
Black/African American	89.5%	86.4%	42.9%	65.3%

Hispanic			71.9%	73.9%
First Generation			75.0%	75.0%

Source: SQL Enrollment Files

Bold italics denote a statistically significant difference between rates at the program and institutional levels, with the lower of the two rates in **bold italics**.

Shaded cells pertaining to retention rates indicate that statistically significant differences for those groups were not found at the institutional level.

Note: Spring 2020 grades of EW (Excused Withdrawal) are not included in the calculations of the three-year retention and successful course completion rates reported above. This approach reflects the standard recommended research practice of not including EWs in either the numerator or the denominator for these rates.

RPIE Analysis: This analysis of student equity focuses on the three demographic groups with significantly lower retention and/or successful course completion rates found at the institutional level (vs. the corresponding rates among all other groups of students, combined) over the past three years. Tests of statistical significance were conducted to compare program-level and institution-level rates among the three groups listed above.

Within the Astronomy Program, the retention rate among Black/African American students was higher than the rate at the institutional level. (The difference was not statistically significant.)

Within the Astronomy Program, the successful course completion rates at the program level were lower than the rates at the institutional level among the following groups:

- *Black/African American (42.9%)*
- *Hispanic (71.9%)*

The difference among Black/African-American students was statistically significant

These patterns deviate from the findings from the comparison of retention and successful course completion at the program vs. institutional level, where the program-level rates reflected the institution-level rates for retention and successful course completion. (See Section I.B.1 above).

Program Reflection:

The Successful Course Completion Rate for Black/African American students taking Astronomy is considerably lower, at 42.9%, relative to the Institution Level, at 65.3%. While the difference is concerning and we should address it, we need gather more data. In particular, we need to get some absolute numbers. In general, we have observed that the number of Black/African American students taking Astronomy is low. Hence, if one or two students from this group do not successfully complete the astronomy course, the Successful Course Completion Rate falls significantly. We should put in place early alert mechanisms and point students to campus resources (STEM/MESA Center and Full-time Faculty Office Hours) to get support that would help them to successfully complete astronomy.

3. Retention and Successful Course Completion Rates by Delivery Mode (of Courses Taught through Multiple Delivery Modes, i.e., In-Person, Hybrid, and Online)

This section does not apply to the Physics Program, as courses associated with the program were not offered through multiple delivery modes within the same academic year between 2017-2018 and 2019-2020.

C. Student Achievement

1. Program Completion

	2017-2018	2018-2019	2019-2020
Degrees			
Physics: AS-T	15	21	36
Institutional: AS-T Degrees	112	93	128
Average Time to Degree (in Years)⁺			
Physics: AS-T	5	4	4
Institutional: AS-T Degrees	4	4	5

Source: SQL Award Files

*Time to degree/certificate within the program reported among cohorts with at least 10 graduates within the academic year. Asterisk indicates that data have been suppressed.

+Average time to degree/certificate was calculated among students who completed a degree/certificate within 10 years (between first year of enrollment at NVC and award conferral year). Among 2017-2018 completers, the average time to degree/certificate was calculated among students who enrolled at NVC for the first time in 2008-2009 or later. Among 2018-2019 completers, the average time to degree was calculated among students who enrolled at NVC for the first time in 2009-2010 or later.

RPIE Analysis: The number of AS-T degrees conferred by the Physics Program increased by 140% between 2017-2018 and 2019-2020. Over the same period, the number of AS-T degrees conferred by the institution increased by 14.3%. The Physics Program accounted for 13.4% of the AS-T degrees conferred in 2017-2018 and 28.1% of those conferred in 2019-2020. The average time to degree among Physics AS-T recipients ranged from 4 to 5 years over the past three years. The average time to degree among AS-T recipients across the institution also ranged from 4 to 5 years during this period.

Program Reflection:

The 140% increase in conferred degrees is encouraging. Our program has not grown by 140%, so this likely reflects the work of counselors. Physics faculty will continue referring students to Academic Counseling.

2. Program-Set Standards: Job Placement and Licensure Exam Pass Rates

This section does not apply to the Physics Program, as the discipline is not included in the Perkins IV/Career Technical Education data provided by the California Community Colleges Chancellor's Office, and licensure exams are not required for jobs associated with the discipline.

II. CURRICULUM

A. Courses

Subject	Course Number	Approval Date	Has Prerequisite* Yes/No	In Need of Revision <i>Indicate Non-Substantive (NS) or Substantive (S) & Academic Year</i>	To Be Archived <i>(as Obsolete, Outdated, or Irrelevant)</i> & Academic Year	No Change
PHYS	110	1/16/2018	No			X
PHYS	111	1/16/2018	Co-req	S (2020-2021) Co-req -> co or pre req		
PHYS	120	1/15/2016	Yes			X
PHYS	121	1/16/2018	Yes			X
PHYS	140	8/11/2014	Yes			X
PHYS	240	8/11/2014	Yes			X
PHYS	241	8/11/2014	Yes			X
PHYS	199	1/01/1986	No		X	
PHYS	250	1/13/2017	Yes		Obsolete (2020-2021)	
ASTR	110	1/16/2018	No			X
ASTR	110	6/09/2017	No		Obsolete (2020-2021)	

*As of fall 2018, prerequisites need to be validated (in subsequent process) through Curriculum Committee.

B. Degrees and Certificates[†]

Degree or Certificate & Title	Implementation Date	Has Documentation Yes/No	In Need of Revision+ <i>and/or Missing Documentation & Academic Year</i>	To Be Archived* <i>(as Obsolete, Outdated, or Irrelevant)</i> & Academic Year	No Change
Physics: AS-T	not listed	Yes			X

*As of fall 2018, discontinuance or archival of degrees or certificates must go through the Program Discontinuance or Archival Task Force.

[†]Degrees and Certificates cannot be implemented until the required courses in them are approved and active.

Program Reflection:

PHYS 111 Co-req needs to be modified as pre- OR co-req
 PHYS 250 can be archived

ASTRO 111 should be achieved.

III. LEARNING OUTCOMES ASSESSMENT

A. Status of Learning Outcomes Assessment

Learning Outcomes Assessment at the Course Level

For Physics:

Number of Courses	Number of Courses with Outcomes Assessed		Proportion of Courses with Outcomes Assessed	
	Over Last 4 Years	Over Last 6 Years	Over Last 4 Years	Over Last 6 Years
8	8	8	100%	100%

For Astronomy:

Number of Courses	Number of Courses with Outcomes Assessed		Proportion of Courses with Outcomes Assessed	
	Over Last 4 Years	Over Last 6 Years	Over Last 4 Years	Over Last 6 Years
1	1	1	100%	100%

Learning Outcomes Assessment at the Program/Degree/Certificate Level

Degree/Certificate	Number of Outcomes*	Number of Outcomes Assessed		Proportion of Outcomes Assessed	
		Over Last 4 Years	Over Last 6 Years	Over Last 4 Years	Over Last 6 Years

Program Reflection:

SLO assessment schedule has been followed.

B. Summary of Learning Outcomes Assessment Findings and Actions

As a result of assessment, faculty have increased awareness of qualitative problem solving being the most challenging area for students.

Program Reflection:

To support students, faculty have been engaging in more qualitative problem solving with students during class time and to focus more review and practice on this area. We have discussed this in department meetings and included adjunct faculty in those discussions, for example on flex day.

The program is appreciative of support for supplemental instruction and will continue to use this as available. SI sessions offer an additional place for students to debate and discuss concepts.

IV. PROGRAM PLAN

Based on the information included in this document, the program is described as being in a state of:

- Viability
- Stability
- Growth

*Please select ONE of the above.

This evaluation of the state of the program is supported by the following parts of this report:

Over the recent 3 years:

- **Enrollment:** there has been some decline in General Education and Calculus-based physics tracks, but an increase in the General Physics (for health sciences students).
- **Retention and completion:**
 - the retention rate for the Physics Program was significantly higher than the rate at the institutional level.
 - the successful course completion rate for the Physics Program was significantly higher than the rate at the institutional level.
- **Equity:** Successful course completion rates were higher than the rates at the institutional level among all three studied equity groups. The differences among Hispanic and First-Generation students were statistically significant.
- **Achievement:** The number of AS-T degrees conferred by the Physics Program increased by 140% between 2017-2018 and 2019-2020

Complete the table below to outline a three-year plan for the program, within the context of the current state of the program.

Program: _____ Physics _____

Plan Years: _____ 2020-2021 to 2023-2024 _____

Strategic Initiatives Emerging from Program Review	Relevant Section(s) of Report	Implementation Timeline: Activity/Activities & Date(s)	Measure(s) of Progress or Effectiveness
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Investigate calculus supplement for pre-health track	Enrollment	<ul style="list-style-type: none"> Faculty discussion (flex day Sp 2021) Consultation with Counseling (Sp 2021) 	Decision about whether to pursue it: if so, submit to curriculum
Lab laptop refresh	Equity, Retention	Planning and budget (every semester until complete)	Unit plan submitted
Computer lab refresh	Equity, Retention	Planning and budget (every semester until complete)	Unit plan submitted
Lab equipment refresh	Enrollment, Equity, Retention	<ul style="list-style-type: none"> Faculty discussion (flex day Sp 2021) to prioritize equipment 	Unit plan submitted
Shift to using Open Resources	Enrollment, Equity, Retention	Faculty discussion (flex day, Sp 2021, Fa 2021, and continuing)	Increased department use of Open resource materials.

Describe the current state of program resources relative to the plan outlined above. (Resources include: personnel, technology, equipment, facilities, operating budget, training, and library/learning materials.) Identify any anticipated resource needs (beyond the current levels) necessary to implement the plan outlined above.

Note: Resources to support program plans are allocated through the annual planning and budget process (not the program review process). The information included in this report will be used as a starting point, to inform the development of plans and resource requests submitted by the program over the next three years.

Description of Current Program Resources Relative to Plan:

Physics (in conjunction with engineering) relies on laptops in lab to collect and analyze data, and on the computer lab in the 1800 building for problem solving. These computers are barely limping along, and a refresh is overdue.

We also budget each year for replacement and refreshment of laboratory equipment. Compared to other labs on campus, we have a low budget for this which we should consider modifying. We currently do not have a priority list of lab equipment, and faculty will work on this during Flex meetings.

For Astronomy, we have a good number of telescopes that we can use for Night Observations. We are suggesting to bring back Night Observations to outreach to students interested in Astronomy and/or other related science programs.

V. PROGRAM HIGHLIGHTS

A. Recent Improvements

- Massive switch to online education in Sp 2020 and Fa 2020, including development of resources that faculty will use even when in person classes resume.
- Adoption of open resources in PHYS 120/121

B. Effective Practices

- SLO assessments are up to date
- Faculty have been trained on distance education
- Faculty refer students to campus resources including Academic Counseling and the MESA center
- Faculty utilize Supplemental Instruction when available

Feedback and Follow-up Form

Completed by Supervising Administrator:

Robert Van Der Velde, Senior Dean

Date:

11/17/2020

Strengths and successes of the program, as evidenced by analysis of data, outcomes assessment, and curriculum:

Physics & Astronomy is a strong program, with very good retention and student success rates, including across demographic groups. Productivity is high, with the potential to add sections, particularly in Astronomy.

Areas of concern, if any:

Aging equipment and out-of-date computer technology is a significant concern for the future of this program, and requires institutional resources to address.

Recommendations for improvement:

- As discussed above, the program requires an institutional commitment to updating computer technology and to provide budget for acquisition of equipment to keep the program up-to-date. The program should develop a schedule of proposed purchases.
- Reinvigorating “observation nights” along with connections to local astronomy groups, including area high schools, will be an excellent post-pandemic tool for engagement of current and future students.
- Astronomy should be considered as a general education course in Physics & Astronomy rather than as a separate “program” as it constitutes a single course.

Anticipated Resource Needs:

Resource Type	Description of Need (Initial, Including Justification and Direct Linkage to State of the Program)
Personnel: Faculty	
Personnel: Classified	
Personnel: Admin/Confidential	
Instructional Equipment	The program must identify specific equipment needs and continue to submit those via unit plans, though it must be noted that the last two rounds of such requests have not received any funding. This pattern must change if the program is to continue to be successful.
Instructional Technology	Aging laptops (>10 years!) and computer labs sorely need refresh.
Facilities	
Operating Budget	
Professional Development/ Training	

Library & Learning Materials	
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