Natural Science

2019
ANNUAL REPORT OF PROGRAM DATA

UNIVERSITY of HAWAI'I®
KAUA'I
COMMUNITY COLLEGE

APRU Purpose

It's good to think about our purpose so we don't end up jumping through superfluous hoops or doing things a specific way simply because it has previously been done this way. As we understand it, the purpose here is to inform others, make the program accountable, solicit feedback, and, through development of this report, provide the program faculty a chance for clarity, organization, and reflection on the program under their responsibility. We want to ensure the program is competently serving the students, the UH system, and the taxpayers.

1. Program Description

Program or Unit Mission Statement

The purpose of the Associate of Science in Natural Science (ASNS) degree is to address the needs of students interested in science, technology, engineering, and mathematics (STEM). Students can use the AS degree in Natural Science to better market their science background for science technician position or in preparation for transfer to a four-year institution in an effort to prepare a larger and stronger STEM workforce in Hawaii. There are three ASNS concentrations: Biological Sciences, Physical Sciences, and Engineering. Each provides a clear pathway to properly prepare students for transfer with core introductory courses and labs in biology, chemistry, engineering, math, and physics typically required in the first two years of a broad range of science and engineering baccalaureate degrees at four-year universities.

Part I. Program Description

Date of Last Comprehensive Review	Program formally established by BOR in spring 2019
Date Website Last Reviewed/Updated	
Target Student Population	Transfer students in STEM
External Factor(s) that Affected the Program or Unit	Overall Statewide declining enrollment

2. Analysis of the Program

The Overall Program Health is Cautionary

	Demand Indicators	2016-17	2017-18	2018-19	Demand Health
1	Number of Majors	20	32	42	Healthy
1a.	Number of Majors Native Hawaiian	8	7	12	
1b.	Fall Full-Time	0.47	0.41	0.6	
1c.	Fall Part-Time	0.53	0.59	0.4	
1d.	Fall Part-Time who are Full-Time in System	0.05	0.03	0.07	
1e.	Spring Full-Time	0.48	0.44	0.66	
1f.	Spring Part-Time	0.52	0.56	0.34	
1g.	Spring Part-Time who are Full-Time in System	0	0.16	0.05	
*2.	Percent Change Majors from Prior Year	0.08	0.6	0.3	
3	SSH Program Majors in Program Classes	115	218	496	
4	SSH Non-Majors in Program Classes	1164	1051	1078	
5	SSH in All Program Classes	1279	1269	1574	
6	FTE Enrollment in Program Classes	43	42	52	
7	Total Number of Classes Taught	34	34	42	

	Efficiency Indicators	2016-17	2017-18	2018-19	Efficiency Health
8	Average Class Size	12	12	13	Cautionary
*9.	Fill Rate	0.516	0.532	0.545	
10	FTE BOR Appointed Faculty	2.75	3.25	5	
*11.	Majors to FTE BOR Appointed Faculty	7	9	8	
12	Majors to Analytic FTE Faculty	5	8	8	
12a.	Analytic FTE Faculty	4	4	5	
13	Overall Program Budget Allocation	0	0	0	
13a.	General Funded Budget Allocation	0	0	0	
13b.	Special/Federal Budget Allocation	0	0	0	
13c.	Tuition and Fees	0	0	0	
14	Cost per SSH	0	0	0	
15	Number of Low-Enrolled (<10) Classes	13	14	12	
16	Successful Completion (Equivalent C or Higher)	0.79	0.81	0.86	
17	Withdrawals (Grade = W)	20	21	28	
*18.	Persistence Fall to Spring	0.74	0.66	0.69	
18a.	Persistence Fall to Fall	0.16	0.38	0.31	
19	Unduplicated Degrees/Certificates Awarded Prior Fiscal Year	3	2	11	
19a.	Associate Degrees Awarded	3	3	13	
19b.	Academic Subject Certificates Awarded	0	0	0	
19c.	Goal	0	0	0	
19d.	Difference Between Unduplicated Awarded and Goal	0	0	0	
20	Transfers to UH 4-yr	0	6	2	
20a.	Transfers with degree from program	0	1	0	
20b.	Transfers without degree from program	0	5	2	
20c.	Increase by 3% Annual Transfers to UH 4-yr Goal				
20d.	Difference Between Transfers and Goal				

	Distance Indicators	2016-17	2017-18	2018-19
21	Number of Distance Education Classes Taught	3	1	3
22	Enrollments Distance Education Classes	20	6	16
23	Fill Rate	0.4	0.4	0.36
24	Successful Completion (Equivalent C or Higher)	0.8	0.17	0.81
25	Withdrawals (Grade = W)	2	2	1
26	Persistence (Fall to Spring Not Limited to Distance Education)	0.61	0.5	1

	Performance Indicators	2016-17	2017-18	2018-19
27	Number of Degrees and Certificates	3	3	13
28	Number of Degrees and Certificates Native Hawaiian	1	0	3
29	Number of Degrees and Certificates STEM	4	6	13
30	Number of Pell Recipients[1]	2	1	10
31	Number of Transfers to UH 4-yr	0	6	2

Context for the Numbers

The Associate of Science in Natural Science (ASNS) program surpassed its provisional status and was formally established by the UH Board of Regents in spring 2019. It would be easy to waive aside the Cautionary status for overall program health by reminding everyone the program is still relatively new and growing. The steady increase in enrollment offers support. But we'll skip the deep dive into the numbers and each health indicators. You can easily read the numbers and indicators yourself without them being restated in prose form. Further, there are still reasons to remain suspicious of these ARPD numbers, despite our efforts and the proactive diligence of our IR. Small changes can make large differences because of the relatively small number of majors in a relatively new and niche program. The number of majors is undoubtedly correct in the technical definition. A more complicated view emerges when talking with students in ASNS courses, whether or not they are enrolled in the ASNS program.

In earlier years, we noted the disparity between a relatively large number of students taking courses like advanced chemistry specifically required for science majors at UH Manoa (CHEM 162) and the much smaller number of students enrolled in the ASNS program. Through short surveys conducted in targeted class visits, we identified a number of students who should have been enrolled in the major but were not. In subsequent visits, we solicited applicants and enrolled a number of students into the science major, since it was a better match for their academic goals. It was a win-win for the program and the students. The efforts to know our students continued and expanded over the past year and into this semester. The results shed light on some issues still facing students, the program, and our ability to more precisely assess its health. In addition to uncertainty in the "true" number of majors, iterative improvements in the exact list of what should and should not count as ASNS courses have continued with the most recent update occurring this semester. For example, a total of 7 sections of non-ASNS program courses are included in the ARPD, with about half of them low-enrolled, i.e. BIOL 100/100L, BIOL 110v, and PSY 240. Thus, the metrics, numbers, and indicators should be taken with a grain of salt.

KCC Fast Facts Program Dashboard by Amanda Fluharty:

SPRING 2019
Natural Science

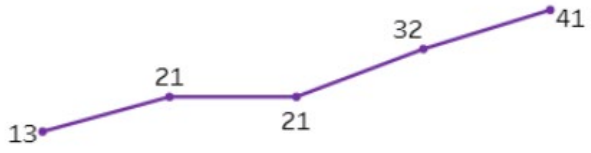
STUDENT ENROLLMENT

Headcount In	41

STUDENT CREDIT LOAD

Full-Time	65.9%
Part-Time	34.1%

FIVE-YEAR TREND (HEADCOUNT)



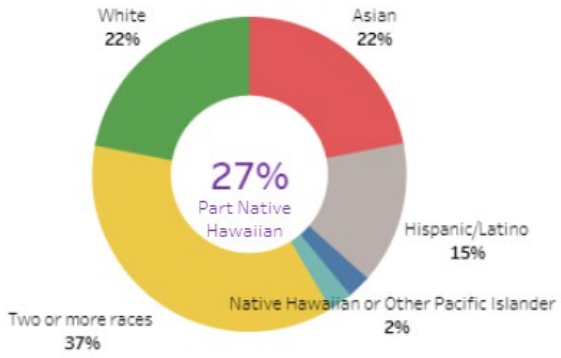
FINANCIAL AID

Not Pell Awarded	58.5%
Pell Awarded	41.5%

AWARD TYPE SOUGHT

General & Pre-Professional

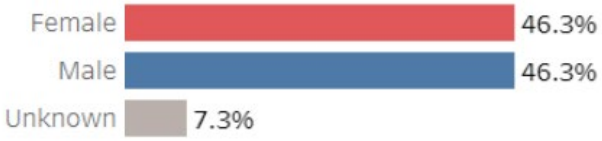
STUDENT ETHNICITY (IPEDS CATEGORIES)



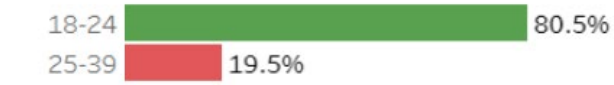
STUDENT SPECIALIZATION

	N	% of Total
Null	4	10%
Biological Science	23	56%
Engineering	9	22%
Physical Science	5	12%
Grand Total	41	100%

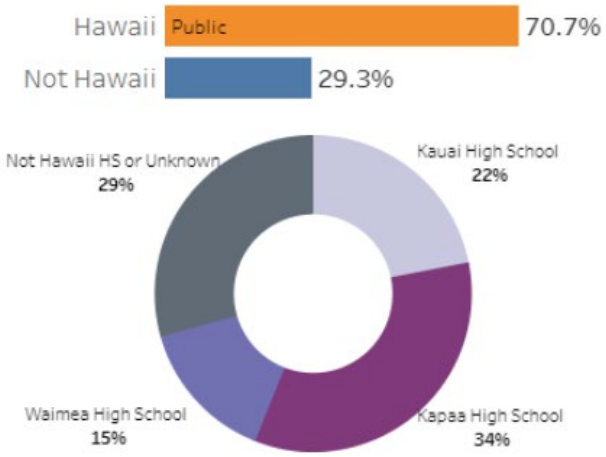
STUDENT GENDER



STUDENT AGE



STUDENT HIGH SCHOOL



Problems, Impacts, and Solutions

Issues related to demand, efficiency, and effectiveness stem from a set of problems affecting multiple health indicators. Therefore, we'll address each problem, why it matters for students and health indicators, and follow up with steps to mitigate or solve the problem.

Problem 1: Students not in correct major for their ambitions
Surveys of students conducted systematically and opportunistically indicated the problem went both ways:

- Students not in the ASNS major when they should (e.g. last year there were 3 KCC students who were not enrolled in the major despite taking most or all required ASNS courses; one student is currently in a STEM program at UH Manoa and the other 2 are still at Kauai CC; all three were pro-actively identified and encouraged to change their major to ASNS over the past 3 semesters)
- Students in the ASNS major when they should not (e.g. students interested in careers in agriculture or health with no intention of taking core, required ASNS courses or pursuing the degree)

Impact of problem 1

The problem is of concern particularly in how it impacts students time to completion and degree attainment. Time to completion is affected since it may be more challenging for them to stay on track if they are not enrolled in the proper major. It makes it harder or impossible for them to get credit for a degree they may have earned while on campus or through reverse transfer. The problem may not end up affecting the health metric because enrollments are indeed growing, even if the "true" number of students who really should be in the major is not precisely known. For example, increasing enrollment in core ASNS required science courses continues to climb (Table 1), suggesting the number of ASNS majors should also be trending up even if the absolute number of majors may or may not be correct.

Table 1. ASNS Core Required Science Course Enrollment

Semester	F15	F16	F17	F18	F19
BIOL 171/171L	11	11	19	20	24
CHEM 161/161L	25	23	32	41	38
PHYS 170/170L	10	12	8	14	15
Total	**46**	**46**	**59**	**75**	**77**

* BIOL 171/171 numbers includes students in MARE 171/171L

Correctly categorizing majors can affect many health indicators. Summarizing impacts on key metrics of program health:

- Time to completion (e.g. students unaware of course sequencing or prerequisites, especially for math)
- Completers and completion rate
- Number of majors
- Percent change of majors from prior year
- Persistence from fall to spring
- Majors to FTE faculty ratio

Solution to Problem 1

We took the following steps to mitigate or solve Problem 1.

- Formation of STEM Cohort – students interested in science enroll in a pre-set suite of courses in their first semester, providing a more prescriptive guide for their course scheduling.
- STEMinar – the STEMinar, SCI 170, was included in the STEM cohort in Fall 2017. SCI 170 is a 1-credit seminar that introduces students to academic pathways and career possibilities in science. SCI 170 was designed to inspire student interest and introduce some of the disciplines and challenges in modern science. Students see concrete examples of what people actually do in STEM fields and how their coursework prepares them to address societal challenges in an interesting and fulfilling way. For example, students heard from two guest speakers, a recent BS degree recipient and a retired scientist who had a varied and impressive career in both the public and private sector. The STEMinar can help resolve problem 1. Through course, the instructor gets to know the students and provides a

specific assignment for them to map out their 4-yr course plan for their prospective BS degree. We found that even some students in the STEM cohort were not necessarily in the major best suited for their goals. But, at least we could identify misplaced students in the first semester and discuss their options going forward.

- Changes to the ASNS program curriculum – A PAR was submitted in fall 2019 to the curriculum committee. One proposed change is STEMinar, SCI 170, will be specifically required for the degree. An ASNS faculty member will get to know the students and their aspirations. Further, all ASNS students will map out their 4-yr course plan for their prospective BS degree in their very first semester.
- We still face the challenge of identifying students who should be in the major but are not.

Problem 2: Students not taking key sequence courses at the right time

Dependent course sequencing is much more prevalent in the ASNS than the other transfer programs. Most notably, students need to start on the pathway to calculus in their first semester or risk needing a full extra year of college to catch up to the sequencing. STAR GPS was designed to guide students but course offerings listed in STAR GPS did not reflect when the courses were actually offered at the college. For example, STAR GPS indicated each course in the two semester sequences of biology, chemistry, and physics are offered in both fall and spring semesters. In reality, each course in the sequences is offered in only one specific semester for practical personnel reasons. For example, MATH 243 is only offered in fall and MATH 242 and 244 are only offered in spring but STAR GPS indicated both courses were offered in both fall and spring.

Impact of problem 2

Negative, cascading effects snowball when students do now expeditiously tackle math courses on the path to calculus. Similarly, students sometimes suffered a setback when relying on incorrect STAR GPS scheduling in developing their 2-yr plan. ASNS students pursuing the biological or physical science concentrations need to complete two semesters of calculus and two semesters of calculus-based physics; ASNS students pursuing the engineering concentration need to complete four semesters of calculus along with two semesters of calculus-based physics. Summarizing impacts on key metrics of program health:

- Time to completion increases
- Persistence decreases as some students change major rather than face an extra year
- Completion decreases as students transfer without the degree

Solutions to problem 2

We took the following steps to mitigate or solve Problem 1.

- Accelerated math – the math program devised and now offers accelerated, intensive math courses where students can complete two, intensive 8-week courses in a single semester, e.g. MATH 103 and MATH 140X offered in back-to-back 8-week sequences in the fall 2019 semester. This makes it much easier for students to qualify to take calculus and thus be ready to take the full year of calculus and calculus-based physics required by all three ASNS degree concentrations.
- STEM Cohort – as mentioned, the cohort offers students pre-set suite of courses in their first semester, providing a more prescriptive guide for their course scheduling.
- STEMinar – As mentioned, students in the STEMinar, SCI 170, will be specifically required for the degree. An ASNS faculty member will get to know the students and their aspirations. Further, all ASNS students will map out their 4-yr course plan for their prospective BS degree in their very first semester.
- Updating STAR GPS – The SAM division chair carried forward our concerns and worked with the STAR GPS coordinator to see that its offerings matched our actual course offerings for this year. The Office of the VCAA stepped up to help ensure coordination in the future for all programs across the campus.

Problem 3: Low fill rate (55%), especially in engineering courses engineering students; EE 160 required for the engineering ASNS should be offered every year

Collective fill rate over the last 5 semesters for ICS 111, EE 160, EE 211, EE 213 (6 sections total) is 36%. The fill rate for EE 211 and EE 213, both 4-credit courses, is just 16% (3 courses) averaging just 2.3 students/course (Table 2). There are 7 engineering majors at UH Manoa; all require EE 160, though ICS 111 can be substituted for some of those majors. EE 160 and ICS 111 fulfill the same requirement. Offering both in the same academic year unnecessarily reduces the fill rate. Most of the 7 engineering majors at UH Manoa don't require ICS 111, EE 211, nor EE 213, including the most popular engineering choice for KCC students, Civil Engineering. It is then hard to justify offering EE 211 and 213 when the fill rates are extremely low (20% and 7%, respectively in Table 2) and the courses are not required for most of the majors our engineering students want to pursue at UH Manoa.

Table 2: Student enrollment in select ASNS courses by semester

Course	Capacity	F17	S18	F18	S19	F19	S20	Fill rate	Req'd **
EE 160	15	4			10			47%	yes
ICS 111	15		10				offered	67%	no
EE 211	15			4		2		20%	no
EE 213	15				1		offered	7%	no
MATH 243	24	6		6		7		26%	yes
MATH 244	24		4		4		offered	17%	yes
PHYS 272/272L	24		8		11		offered	40%	yes

** EE 160 is required by all 7 engineering BS degrees at UH Manoa
** ICS 111 can be substituted for EE 160 in 5 of the 7 engineering BS degrees at UH Manoa
** EE 211 and EE 213 are specifically required by only 2 of 7 engineering BS degrees at UH Manoa
** MATH 243/244 are required by several STEM BS degrees at UH Manoa in addition to all 7 engineering degrees; they also fulfill ASNS degree engineering concentration requirements at KCC
** PHYS 272/272L fulfill physics requirements for all three ASNS concentrations at KCC

In contrast, low enrollments in MATH 243/244 and PHYS 272/272L are more tolerable. MATH 243/244 courses are specifically required by several STEM BS degrees at UH Manoa in addition to all 7 engineering degrees. Students really need these courses for their future academic career. MATH 243/244 are also required for the engineering concentration ASNS degree at KCC. Students passing MATH 243/244 or PHYS 272/272L should be earning an ASNS degree. PHYS 272/272L is required by all three ASNS concentrations (biological science, physical science, and engineering). MATH 243/244 and PHYS 272/272L are typically completed in the students' last semester of the ASNS. The low fill rates in MATH 244 and PHYS 272/272L and more palatable since it leads to more STEM graduates from KCC, which boosts one of our performance metrics.

Additionally, several students this year wanted to take EE 160 at our campus but are either skipping it or taking EE 160 online through Windward CC since it is not offered at our campus this year. We are losing SSH to another campus.

Impact of problem 3

The inefficient use of instructional resources is not sustainable. The inefficiency negatively impacts health metrics for the entire ASNS program through lowered fill rate. Non-optimal schedule of offerings of engineering/computer science have reduced completion of degrees as students transfer without completing superfluous courses for their major required by the current engineering concentration. EE 211 and EE 213 are specifically required for the engineering ASNS degree but not for most of the engineering BS degrees our students hope to obtain. Meanwhile KCC students' options for completing a necessary course, EE 160, are limited because it is not frequently offered. The offerings of EE 211 and 213 are each 4-credit courses, making instructional resources particularly costly.

Solution to problem 3

Change the engineering PAR for our ASNS and change course offerings to:

- Keep the requirement for EE 160; drop the requirement for EE 211
- Offer EE 160 every year instead of every other year
- Offer EE 211 and EE 213 only when there is more reasonable student demand

ICS 111 fulfills the same requirement as EE 160, but EE 160 is more universally accepted. Offering only EE 160 would have likely captured the ICS 111 students in the 2017-2018 academic year, greatly increasing the fill rate from 47% (14 of 30 student capacity) to 93% (14 of 15 student capacity) in Table 2. Transfers are also affected. Fixing these problems will lead to an increase in students earning the engineering concentration degree, and possibly more interested in enrolling in the concentration. We might attract more engineering students boosting enrollment in EE 160 and MATH 243/244. We will also be able to capture more students with engineering degrees through reverse transfer. But the topic of transfers is more complicated. It appears most ASNS students transfer to non-UH campuses, i.e. compare line 19 to line 20a and 20b in the ARPD table. But, the PHYS 272 instructor, Brad Dempsie, counted a total of 4 ASNS students enrolled at Manoa who earned the ASNS at KCC in the past year. Lines 20a and 20b in the ARPD table indicate there is a total of only 1 such student. Mr. Dempsie tracked his PHYS 272 students in spring 2019 and believes 6 actually transferred to UH Manoa (see below).

PHYS 272 Student Spr-2019	Tracking Result
1	transferred to nursing at KCC
2	transferred to Canadian University
3	transferred to UH Manoa
4	ASNS in progress (KCC)
5	transferred to STEM UC Berkley
6	ASNS in progress (KCC)
7	transferred to UH Manoa STEM program
8	transferred to Canadian University
9	transferred to UH Manoa STEM program
10	transferred to UH Manoa STEM program
11	ASNS in progress (KCC)
12	transferred to UH Manoa STEM program
13	transferred to UH Manoa STEM program
14	unknown

Problem 4: Small number and percentage of completers; Logistical barriers to degree completion
Many of the problems mentioned already tie into the logistical barriers to graduation. Graduation numbers were unacceptably low until spring 2019 (Compare the top lines of **Tables 3** and **Table 4**). An implemented solution has been largely, but not completely successful. We deduced a few barriers to completion through surveys and discussions with students. Some students did not want to enroll in our ASNS because of extra course requirements beyond what was required for their desired major at UH Manoa. In response, we streamlined the degree to eliminate superfluous courses and focus on the necessary requirements, i.e. core math, chemistry, physics for all concentrations with the addition of biology courses for the students in the Biological Sciences concentration. The course load was hard enough without the superfluous electives. With some changes, the ASNS now provides the basic core for quite a few majors at UH Manoa and students now have

maximum flexibility to take what fits best with academic goals. Additionally, we identified and corrected a coding error preventing eligible students from meeting the FQ requirement. We also helped track down students to file waivers and re-declare for the major so they would fall under the new ASNS curriculum. Almost all program graduates prior to spring 2019 were the result of such investigation and efforts to obtain special waivers or approvals. The uptick in graduation numbers in spring 2019 in Table 3 was correctly predicted in fall 2018 assessment summary submitted to the VCAA for accreditation purposes.

Table 3. ASNS Degrees Awarded

Academic Year	2014-15	2015-16	2016-17	2017-18	2018-19
Total Completers	.	2	2	3	13
Native Hawai‘ian (#)	.	0	0	0	3
Native Hawai‘ian (%)	.	0	0	0	23%

The large uptick of graduates in 2019 is more reflective of a reasonable number for the program. It is a direct result of the curriculum changes that took effect in fall 2017 to fix issues with the program requirements. Current students have had two years to finish the degree with more reasonable requirements and the more streamlined requirements facilitated reverse transfer for additional students. But some students are still left behind, particularly students interested in engineering, as discussed above in problem 3.

Impact of problem 4

Students and the college miss out on STEM degrees, especially in the engineering concentration

Solution to problem 4

The solutions overlap with those already mentioned, namely:

- Implement changes to the ASNS engineering program curriculum noted in problem 3
- STEMinar – Instructors can use STEMinar, SCI 170, to really get to know students, help ensure they are following the correct path, and identify and help students overcome barriers to completion. Additionally, instructors may help improve retention and completion by building relations, inspiring students, and showing the value in their career choice (i.e. what they can and others have done with STEM degrees).
- Continue proactive surveys of ASNS courses to identify student issues with completion and major declaration

Problem 5: Native Hawai‘ians and the ASNS program; enrollment and completion

We especially want to increase the number of Native Hawai‘ian (NH) students enrolled in the ASNS and the number who complete the degree. The percentage of NH students in the program hovers around a multi-year average of 25% (Table 4). This compares favorably to the campus benchmark of 33% (in 2018) when considering that NH students have been traditionally far under-represented in the sciences across the UH system. Still, we aspire to exceed the baseline. NH graduation is more problematic as the number of completers has lagged (Table 3) despite hitting a milestone. The three degrees awarded in spring 2019 were our first by Native Hawai‘ian students ever for our program.

Table 4. Declared ASNS Majors

Academic Year	2014-15	2015-16	2016-17	2017-18	2018-19
Actual	15	19	20	32	42
Native Hawai'ian (#)	2	5	8	7	12
Native Hawai'ian (%)	13%	26%	40%	22%	29%

Impact of problem 5

Both STEM graduates and NH graduates are performance metrics. We want to end the cycle of under-representation of Hawai'ians in science

Solutions to problem 5

ASNS faculty are involved in Kaua'i CC's Hālau Ola Honua (HOH) grant, which is part of a multi-campus National Science Foundation (NSF) Tribal Colleges and Universities Program (TCUP) award. The primary goal of the grant is to increase Native Hawai'ian (NH) enrollment in environmental and geoscience at 4-yr UH universities. The grant allowed us to hire Brad Dempsie, the physics teacher and "Environmental Science Specialist" ultimately hired through the award. The addition of a third physical scientist who can teach core ASNS physics courses (PHYS 170/170L, PHYS 272/272L) has resolved a teaching load problem. Prior to the grant, the other two physical science teachers frequently faced teaching overloads, which made it difficult to dedicate time to running a successful program by, for instance, identifying enrollment and graduation problems and developing and implementing solutions. Grant participants have learned much more about Hawai'ian culture through monthly grant meetings and professional development events focused on NH issues and approaches on and off-island. We acquired equipment such as laptops for the program and facilitated engagement of science in the community through numerous student service-learning projects. We track approaches and relative effectiveness of different approaches to increasing NH participation at other UH campuses, e.g.

- Guidry, M., A. Eschenberg, K. Lee, S.V. Taylor, R. Alegado, M.A. McManus, D. Krupp, J.K. DeLay, F.W. McCoy, B. Dempsie, M. Nathan, P. Srsen, A. Tanigawa, and J. Kaakua (2018), "*Creating and maintaining a successful geoscience pathway from 2YC to 4YC for Native Hawai'ian Students: A Progress Update.*" American Geophysical Union Fall Meeting, Dec. 2018, Abstract ED22A-03.

Additionally, we submitted a proposed new, indigenized course, OCN 102, to the curriculum committee and are contemplating a new Environmental Science concentration in the ASNS degree program, which has been held up in discussions among the multi-campus group and UH system. We have to shepherd those along to see them through. Further, we have formed but not yet held an advisory board meeting on Kaua'i. We are encouraged by the continued increase in NH students enrolling in science on our campus. We hopeful this trend will continue and will continue to monitor progress and solicit ideas.

3. Program Student Learning Outcomes

The previous section discussed student completion issues and plans to address them. Successful course completion numbers for ASNS courses is very good, i.e. increasing to 86% for 2018-2019 in item 16 in the ARPD table. Developing meaningful assessments of student learning for the collective program remains a challenge.
The extent and nature of program assessment has implications for our accreditation status. Quality, meaningful assessment can improve student learning by helping teachers identify gaps, problem areas, and effective teaching strategies. Yet

meaningful assessment that guides clear, evidence-based teaching pedagogy is not necessarily what we have been trained to do. And it is quite difficult to do well, even for educational assessment experts.

Several ASNS faculty met and agreed our goal is for meaningful assessment of student learning that is genuinely useful in guiding pedagogy. This will be our primary consideration. We reviewed our assessment plan (**Table 5**) and felt it was too broad and it could be more detailed and useful.

Table 5: PSLO Assessment plan and results presented in fall 2018 APRU

PSLO	Assessed this APRU Cycle (Y or N)	Findings	Improvements Implemented	Next Assessment
1. Analyze data effectively using currently available technology.	N All CSLOs in Chem 162L & Phys272L			2018-2019
2. Communicate scientific ideas and principles clearly and effectively.	Y Phys 272L SLO#3	100% MET		2018-2019
3. Analyze and apply fundamental mathematical, physical, and chemical concepts and techniques to scientific issues.	Y Phys 272L SLO#3	100% MET		2018-2019
4. Apply fundamental concepts and techniques in their chosen natural science field of study, such as biology, chemistry, engineering, physics, etc.	N All CSLOs in BIOL, CHEM, PHYS, EE as required by concentration.			2018-2019

It should be noted the ASNS coordinator was on sabbatical last year and though he did submit, this APRU report was submitted by the former SAM division chair and we missed an opportunity to highlight changes made to physics labs and a textbook switch as efforts to improve student learning and assessment scores.

We are working on new assessment plan more focused on specific content or skills we see as important for future student success (**Table 6**). We want to design assessments not just to gauge student learning but to more specifically help us inform our strategies so we can improve student learning. We will continue to emphasize mastery in the program by focusing assessment on courses students typically take near the end of the degree. But, as we can, we want to incorporate longitudinal studies across multiple program courses to monitor student progression from early to late stages in the program sequencing. A plan and results are shown further below in a new PSLO #3 assessment, followed by plans for a new PSLO #1 assessment. We will continue developing and refining plans. We will coordinate how, when, and what topics taught between dependent courses and all core subject areas; e.g. vectors (MATH 140X, PHYS 170, 272), differentiation (MATH 241/242, PHYS 170), integration (MATH 241/242, PHYS 170), atomic structure (CHEM 161/PHYS 272).

Table 6: PSLO Assessment plans for the current academic year (2018-2019 data)

PSLO	Assessed this APRU Cycle (Y or N)	Findings	Improvements Implemented	Next Assessment
1. Analyze data effectively using currently available technology.	N Labs and final assessment in PHYS 170L		See assessment plan for PSLO#1 further below	2019-2020
2. Communicate scientific ideas and principles clearly and effectively.	N Lab reports in Phys 272L			2019-2020
3. Analyze and apply fundamental mathematical, physical, and chemical concepts and techniques to scientific issues.	Y Phys 272 for final assessment (but also assessed early in PHYS 170 to gauge improvement)	73% MET	Incorrect answers are used to create distractors and inform mis-conceptions to target in MATH 140x (see assessment plan for PSLO #3 further below)	2019-2020
4. Apply fundamental concepts and techniques in their chosen natural science field of study, such as biology, chemistry, engineering, physics, etc.	N In re-development phase			2020-2021

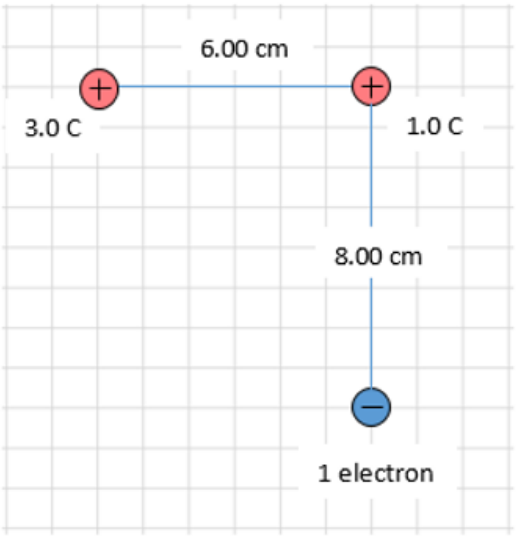
Assessment of PSLO #3 (2018/2019 data)

Addition of vectors is found initially in the MATH 140x course and again in PHYS 170 and PHYS 272. The concept that vector components must be added is a common assessment used to measure success of student learning in the science based physics and engineering courses.

Initial assessment:

2. Consider the point charges shown below.

   a. What will be the Force on the single electron if the 3.0 C and 1.0 C charges are held in place? Report your answer in Polar Co-ordinates. ($|e| = 1.6 \times 10^{-19}\ C$) (6 marks)
   b. What will be the magnitude and direction of the acceleration of the electron? ($m_e = 9.11 \times 10^{-31}\ kg$) (2 mark)



21% of students were successful on Question 2. a.

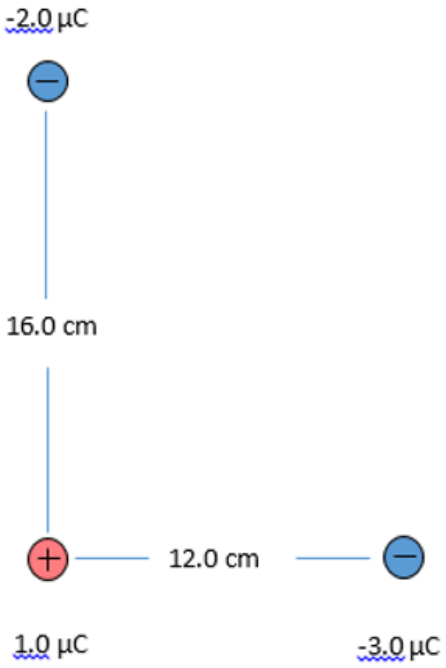
Students are given a chance to re-write the above question, provided they state what they did wrong, what they have learned, and provide a complete solution. A follow-up question is then given on a subsequent test.

Final assessment

In the final assessment, student are given a multiple choice question with distractors that indicate the type of misunderstanding students still have in order to identify individual student misunderstandings. Students are provided with the specific misunderstanding so they can improve moving forward.

8. Consider the point charges shown below. What will be the magnitude and direction of the force on the 1.0 µC charge if the -2.0 µC and -3.0 µC charges are held in place? (2 marks)

a. $2.58\ N\ \hat{r} + 53.1°\ \hat{\theta}$
b. $2.58\ N\ \hat{r} + 20.6°\ \hat{\theta}$
c. $2.00\ N\ \hat{r} + 53.1°\ \hat{\theta}$
d. $2.00\ N\ \hat{r} + 20.6°\ \hat{\theta}$



73% of students were successful on Question 8.
7% a, 14% c

a, b - indicate lack of understanding of vector addition with regards to the magnitude

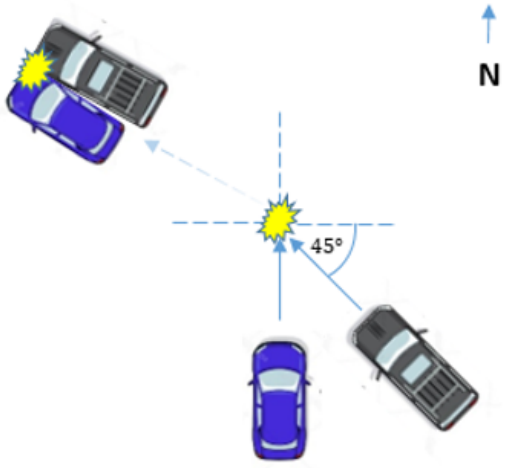
a,c indicate lack of understanding of vector addition with regards to the effect on the angle

Future Plans:

PSLO#3 will be tested in the PHYS 170 course to both collect data and prepare students further. It could also be tested for in the MATH 140x course, which precedes PHYS 170

6. Two vehicles (a car and a truck) are involved in a collision and stick together. Just before the crash the car, with a mass of 1200 kg, is travelling North with a velocity of 47 km/h, while the truck, with a mass of 1900 kg, is travelling North-West with a velocity of 82 km/h.

   a. What is the velocity and direction of the vehicles immediately after the crash? (report the answer in polar co-ordinates) (4 marks)
   b. Is the collision elastic or inelastic? (1 mark)



53% of students were successful on Question 6. a.

PSLO#3 will be tested again in the PHYS 272 course (in the same format seen above) during the Spring 2020 semester. This will allow for further conclusions as to the success of checking the vector addition concept in sooner in the curriculum.

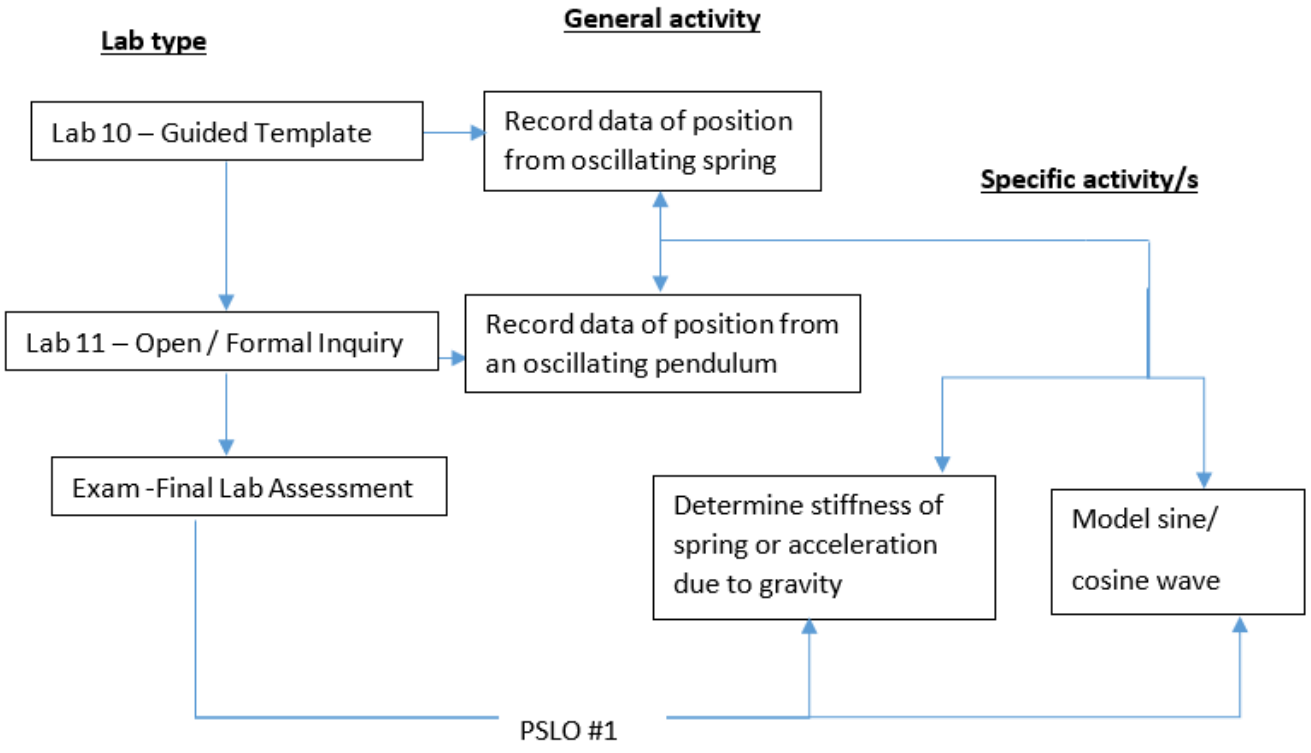
PSLO #1

Students will be given a guided / template lab in PHYS 170L to collect spring position data using a motion detector. This provides students with an initial approach to the concept of data collection, analysis and modelling. Students will then be given the opportunity to perform a similar task, this time with a pendulum. The lab is unguided and requires a formal write-up of the experiment being performed.

Students will ultimately be tested by being given a set of data and needed to display the data in graphical form, analyze and interpret the data in order to build a mathematical model of the data, display the theoretical/mathematical model, and finally students will pull real world data from the model (either the stiffness of a spring or the acceleration due to gravity). This will ensure PSLO #1 is met, that is students will…

PSLO #1: Analyze data effectively using currently available technology.

This will be the first time this PSLO is measured and results will be taken. A flow chart of the expected progression of the concepts is given below.



4. Action Plan

Include how the actions within the plan support the college‘s mission. In addition to the overall action plan for the program, include specific action plans for any Perkins Core Indicator for which the program did not meet the performance level.

Action Plan Activities Completed 2018/2019

Nothing is listed under "Next Steps" in 2018 APRU but the following activities were carried out:

1) STEM cohort with accelerated math and STEMinar (SCI 170)
2) Diagnose issues with enrollment
3) ID misplaced students and help properly place students into ASNS major
4) Diagnose issues and barriers to graduation and transfer; ID potential solutions
5) Conduct HOH grant to help increase NH participation
6) Continue to develop, refine, and implement new program assessment plans

Additionally, a Biological Science position requested through the Liberal Arts program was approved and hired. The new Biological Science hire will also teach courses that are essential for the success of the ASNS program, namely four core biological science courses required for the ASNS degree and for numerous 4-yr BS degrees in biological science. The majority of ASNS majors are enrolled in the biological science concentration, according to "Fast Facts Dashboard" on page 5.

Action Plan Activities Planned for 2019/2020

1) Continue STEM Cohort with accelerated math offerings
2) Continue offering STEMinar, SCI 170
3) Submit updated PARs requiring SCI 170 for all concentrations
4) Submit updated engineering PAR removing EE 211 from engineering concentration requirements
5) Continue efforts to ID students who would be better off in the ASNS major
6) Follow up to see whether STAR GPS reflects actual course offering schedule
7) Consult with engineering/ETRO faculty to ensure EE 160 is offered every year
8) Continue efforts to increase NH enrollment through HOH grant
9) Continue to develop, refine, and implement new program assessment plans
10) Ensure list of ASNS program courses for ARPD is accurate; use formal process to make necessary changes

The collective impacts of these actions will affect the strategic goals in the following ways: little change in ASNS enrollment and NH enrollment is anticipated due to getting the right students into the right major, program health metrics should be more accurate and useful, persistence should increase (in 2021-2022), fill rates should increase (in 2021-2022), degrees awarded should better align with successful completion of PHYS 272/272L, transfers with or without the degree should increase, and, finally, assessment plans should continue to be developed, refined, and implemented as summarized in **Table 7.**

Table 7: Action Plans for 2020

Action Plan	Anticipated Outcome
Action Plan Activities 1-8	Steady or slightly increased number of majors
Action Plan Activities 1-8	Steady or slightly increased number of degrees awarded; degrees awarded should better align with students successfully completing PHYS 272
Action Plan Activities 1-8	Increased NH enrollment
Action Plan Activities 1-8	Increase # transfers to UH-4yr
Action Plan Activity 9	Increased implementation of improved assessment plans

Analysis of Alignment with CPR

List the goals that were identified to be initiated, continued, or completed during this APRU cycle, in your last CPR, and if they were achieved. Be sure to include the benchmark, desired outcome, actual outcome, and unit of measure. If you completed your last CPR prior to 2018, please refer to * in this section.

Table 8: Strategic Goals from 2018-2019

Goal/Strategic Goal or Priority**	Achieved (Y or N)?	Benchmark	Outcome	Unit of Measure
Increase # of majors in program	Yes	+% increase	+31% (32 to 42)	Increase %
Increase # degrees	Yes	+% increase	+330% (3 to 13)	Increase %
Increase # NH in program	Yes	+% increase	+71% (7 to 12)	Increase %
Increase # transfers to UH-4yr	No	%increase	-67% (6 to 2)	Transfers with or without degree
Improve assessment plans	Yes	At least some new plans developed and implemented	2 of 4 new plans; 1 implemented	N/A

**All Strategic Goals and Priorities are Aligned to the College Mission.

5. Resource Implications

Resource Request(s) for next year (from CPR Plan for your program or unit, or one(s) developed in Part V above if CPR was completed prior to 2018).

☒ **I am NOT requiring resources for my program/unit.**