



2020

ANNUAL REVIEW OF PROGRAM DATA

Associate of Science in Natural Science (ASNS)



UNIVERSITY of HAWAII®
KAUA'I
COMMUNITY COLLEGE

1. Program or Unit Description

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 a 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.

2. Analysis of the Program/Unit

The 2019-2020 academic year was the first full year since the ASNS program at Kauai CC was formally upgraded from “provisional” to “established” by the UH Board of Regents in spring 2019. Instructional programs [ARPD health indicators with benchmarks](#) provide a quick view on the overall condition of the program, though context is required to understand the numbers or consider trends. Additionally, the impact of the COVID-19 pandemic on the program is not yet known.

Demand Indicator: Enrollment has increased in each of the past three years but the rate of increase slowed to 2% from 2018-2019 to 2019-2020. Demand is listed as “Cautionary” because 2% growth is below the target set by the UHCC system. A demographic pulse of lower graduating high school student population in Hawaii makes it more challenging to further increase enrollment. Only two of the seven ASNS programs in the UH system (including Kauai CC) have seen enrollment increases in each of the last three years. But there is likely untapped potential that will allow a continued upward trend in enrollment. The ASNS is relatively new. As awareness grows, the program is expected to attract a larger share of promising students who might otherwise have pursued degrees out of state or entirely different careers.

Efficiency Indicator: [Fill rate](#) and the ratio of faculty to majors are listed as “Cautionary.” Efficiency indicators are skewed by low enrolled courses that don’t truly reflect program efficiency. The skewed numbers affect both fill rate and major to faculty ratio. Each year, grant-funded engineering courses run with less than 5 students, e.g. EE 211 with 2 students in fall 2019. Additionally, several courses were erroneously included in the ARPD, all of which were low-enrolled e.g. BIOL 110, BIOL 110L, and PSY 240. A request was made to remove them in November 2019. The request was followed up in 2020.

Steps to improve fill rate percentage and sustainability of the engineering concentration are being taken. These are included in the action plan. Efficiency will continue to be considered. KauCC is the only institution of higher learning on Kauai yet Kauai has just 7% the population of Oahu. Some efficiency trade off may be necessary to continue providing quality access to important STEM careers to Kauai and Hawaii. It is a positive sign that KauCC is able to run the program with enrollment, graduation and transfer numbers that compare favorably to other UHCC’s.

Effectiveness Indicators: The “Healthy” rating is based on high fall to spring persistence of 79%, the highest of all seven ASNS programs in the UH system. Fall to spring persistence has increased steadily over the past three years from 66% to 79%. The absolute number of graduates, eight, is also respectable in relation to other ASNS programs in the UH system considering KauCC’s small size. Only two of the seven ASNS programs in the UH system had more graduates than KauCC last year despite Kauai CC having by far the fewest ASNS majors enrolled. Support effort is necessary to ensure students earning their degree in principle receive it in practice. These efforts are discussed in the action plan.

3. Program Student Learning Outcomes

- a) Program Student Learning Outcomes
1. Analyze data effectively using currently available technology.
 2. Communicate scientific ideas and principles clearly and effectively.
 3. Analyze and apply fundamental mathematical, physical, and chemical concepts and techniques to scientific issues.
 4. Apply fundamental concepts and techniques in their chosen natural science field of study, such as biology, chemistry, engineering, physics, etc.

b) **Table 1:** PSLO Assessment for 2019-2020

PSLO Assessment	Assessed in 2019-2020	Met Benchmark	Improvements Implemented
1. Analyze data effectively using currently available technology.	Y (In PHYS 170L; model sine/cosine wave using data and computer program; relate result to gravitational acceleration of unknown planet	87%	1 st implementation; results promising; keep assessment and compare to 2021-22
2. Communicate scientific ideas and principles clearly and effectively.	Y (Adapted due to pandemic: 90/100 or greater on write up of PSLO#1 assessment meets benchmark)	60%	Better adapt assessment and implement in PHYS 272L as intended
3. Analyze and apply fundamental mathematical, physical, and chemical concepts	Y (Results of impromptu adaptation due to pandemic defied meaningful interpretation)	N/A	Reconfigure assessment for online 272L course

and techniques to scientific issues.			
4. Apply fundamental concepts and techniques in their chosen natural science field of study, such as biology, chemistry, engineering, physics, etc	N		

- c) Assessment results are included in the table 1 “PSLO Assessment” in part b).
- d) Changes made as a result of assessment are also included in table 1. The new program assessment plan was implemented in 2019-2020 academic year. Initial plans faced challenges with the pandemic, particularly since most assessments were designed for PHYS 272L offered in spring 2020 when the pandemic proved most disruptive. PHYS 272L is an ideal course to run summative program assessments since all ASNS students must take this course and it is generally taken in their last semester at Kauai CC. The results for PSLO #1 are encouraging and the process represents an ideal. All students had multiple opportunities for learning how to manipulate data, and there were multiple "formative" assessments leading to this particular "summative" assessment. The impromptu adaptation to assess PSLO #2 is promising and will be continued with minor changes in 2021. The assessment for PSLO #3 will require more significant changes.

4. Action Plan: 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

Past actions have reduced the extent of the following problems:

- We find students who are not enrolled in the ASNS major when they should (e.g. in 2018-19 and now again in 2019-2020 there were 2-3 KCC students who were not enrolled in the major despite taking most or all required ASNS courses; identified students were encouraged to change their major to ASNS)
- There are some students in the ASNS major when they have no intention of completing the degree (e.g. students interested in careers in agriculture, computer science, physical therapy,

aeronautics, etc. with no intention of taking all core, required ASNS courses or completing the AS degree). Surveys and consultations with students show many wish to remain in the ASNS even after learning of other options. There are students interested degrees at out-of-state 4-yr institutions whose requirements don't align well with any associate degrees at KauCC. Faculty reiterate that students need to ensure they are on track to efficiently advance toward their preferred 4-yr degree. Misplaced students may boost enrollment but negatively impact completion rate.

Impact of problem 1

The problem impacts numerous health metrics. Students are less likely to efficiently complete their degree if they are not enrolled in the proper major. The small size of KauCC means relatively few misplaced students or transfers who don't complete the AS degree can have a more significant impact on health metrics.

Table 2: Enrollment in core science courses by semester

Enrollment in core science courses semester	F17	F18	F19	F20
BIOL 171	19	20	24	21
CHEM 161	32	41	38	41
PHYS 170	8	14	15	15
SCI 170	--	15**	4**	10
ASNS Majors	32	42	43	44

** note SCI 170 was part of a cohort in F18 and F19 but not required until F20

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

Solutions to Problem 1

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

- Continue dialogue with academic advisors to keep each other informed on students' interests, preparation, needs, and course considerations
- Survey of students in core ASNS courses normally taken both at the beginning and end of their academic career (SCI 170 and PHYS 272).

- 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. The cohort for fall 2020 was unraveled to facilitate flexibility during the pandemic.

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

Dependent course sequencing is much more prevalent in the ASNS than 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 STAR GPS has led to confusion with incorrect information about course offerings and the semester in which courses are offered. Curriculum changes, such as a new MATH 253 course, need to be properly coded. The necessary communication and steps do not always occur.

Impact of problem 2

Negative, cascading effects snowball when students miss the first course in a sequence, such as 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, especially when core sequence courses are offered only once per year. 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.

- Continuing with 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.
- STEMinar – A newly required course, SCI 170: STEMinar can help. SCI 170 is a 1-credit seminar that introduces students to academic pathways and career possibilities in science. All students map out their 4-yr course plan for their prospective BS degree in their very first semester. SCI 170 has helped to ensure students' near and long-term course plan matches their ambitions, especially considering our limited offerings. The course helps students identify potential issues for students in the first semester and discuss their options going

forward by, for example, gaining awareness of the availability/lack of availability of key courses such as EE 160, overcoming glitches still being worked out with STAR GPS, etc. Almost every student in SCI 170 in fall 2020 changed their current or future academic plans based on activities and feedback as part of the course.

- Updating STAR GPS – This will have to be an ongoing process. Last year, 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.
- STEM Cohort – as mentioned, the cohort offers students a pre-set suite of courses in their first semester, providing a more prescriptive guide for their course scheduling.

Problem 3: Low Fill Rate (especially in engineering and calculus IV courses)

Low-enrolled engineering courses have dragged down the efficiency metric, i.e. EE 160, EE 211, EE 213 (Table 3). The offerings of EE 211 and 213 are each 4-credit courses, making an especially negative impact. The second year of calculus courses and second semester of physics were also low-enrolled.

Table 3: “Enrollment by Course” -- Enrollment in very low-enrolled ASNS courses by semester

Enrollment by Course	Capacity	F17	S18	F18	S19	F19	S20	Fill rate	Req'd**
EE 160	15	4			10			47%	Yes
EE 211	15			4		2		20%	No
EE 213	15				1			7%	No
MATH 243	24	6		6		7		26%	Yes
MATH 244	24		4		4		4	17%	Yes
PHYS 272	24		8		11		12	43%	Yes

** Notes on required courses in Table 3 “Enrollment by Course”

- EE 160 is required by all 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 Kauai CC
- PHYS 272/272L fulfill requirements for all three ASNS concentrations at KCC

Impact of problem 3

The engineering courses were supported by an external grant, offsetting the financial impact to the college. All low-enrolled courses impact the fill-rate metrics for the ASNS program.

Solutions to problem 3

Actions we have taken to ameliorate problem 3:

- Eliminate the need to offer MATH 244. Math faculty created MATH 253, a special accelerated math course that combines MATH 243 and MATH 244 into one course. KauCC established an articulation agreement with UH Manoa and the course is running this fall 2020 with 11 students. This 43% fill rate is already higher than any fill rate we have seen for either MATH 243 or 244 over the last three years (Table 3). MATH 253 fulfills a requirement for all ASNS engineering students and is also required for many physical science BS degrees. All MATH 253 students are at the very end of the 2-year pathway and should complete their ASNS degree.
- Recommendation: Offer specialty engineering courses, EE 211 and EE 213, only when supported by a grant. Even then, it would be much better to offer EE 160 or ICS 111 since they are much more universally required for all engineering majors. EE 211 and EE 213 are only required by 2 of the 7 engineering majors at UH Manoa while one of EE 160 or ICS 111 is required by all 7 engineering majors.
- Continue offering PHYS 272/272L: These courses are required for all ASNS students. All students completing these courses should, theoretically, also complete their ASNS degree. As with MATH 253, we hope to improve on the 43% fill rate but it is tolerable for now as part of a more robust and growing program.
- Continue to encourage Early College math offerings. Early College math makes STEM a less daunting option for incoming KCC students and shortens their pathway. There is little doubt the availability of Early College math offerings has benefitted students and all metrics of ASNS program health.

Problem 4: Barriers to Degree Completion

Many of the problems mentioned already tie into the logistical barriers to graduation. Graduation numbers were too low until spring 2019 (Compare the top lines of **Table 4** “ASNS Degrees by Year”). An implemented solution has been largely, but not completely successful. There are still barriers to completion remaining that should be addressed.

Table 4. ASNS Degrees by Academic Year

ASNS Degrees by Academic Year	2017-2018	2018-2019	2019-2020
Total Degrees	3	13	8
Native Hawaiian (#)	0	3	2
Native Hawaiian (%)	0	23%	25%

Past barriers and fixes: Barriers to completion had been identified through surveys and discussions with students. Spring 2019 saw the fruits of efforts to overcome or reduce barriers to completion. Surveyed showed 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,

the program was streamlined to eliminate superfluous courses and focus on the necessary requirements, i.e. core math, chemistry, physics for all concentrations (and biology courses for the students in the Biological Sciences concentration). 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, a coding error preventing eligible students from meeting the FQ requirement was identified and corrected. It was possible to track down some students to file waivers and re-declare for the major and complete their degree under the new requirements. 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 4 was correctly predicted in the fall 2018 assessment summary submitted to the VCAA for accreditation purposes.

Known present barriers: Ensuring students are in the right major and taking the right courses is challenging. For example, we discovered recently the progressive change of MATH 253 replacing MATH 243 and MATH 244 was not incorporated into STAR GPS. Additionally, engineering students have great difficulty completing their ASNS degree because our college is not offering courses students need. Key engineering courses required by all engineering majors and some specialty courses required by some have simply not been offered, preventing students from completing their AS degree.

Impact of problem 4

- Increased time to completion
- Students and the college miss out on STEM degrees, especially in the engineering concentration.
- Engineering students are set back a semester or more when they transfer because a core lower-division course we are failing to offer is a prerequisite for their upper-division study.
- Some students may even avoid or leave the college and UH system out of frustration

Solution to problem 4

The solutions we have implemented or recommend:

- A PAR changes was submitted for the ASNS engineering program curriculum in fall 2019 with fall 2020 implementation. The change eliminated EE 211 and EE 213 from the curriculum. Students were given the option to complete either EE 160 or ICS 111, since that is the option available to all engineering majors at UH Manoa.
- Continue proactive solicitation of feedback from students in PHYS 272, typically the last course they take at Kauai CC, to identify student issues with transfer and completion
- Recommendation: It is important we find a way to allow students to take one of EE 160 or ICS 111 as required for the engineering ASNS. Transfer students also desperately need one of the two courses as they are prerequisites for a sequence of required courses in all engineering majors at UH Manoa.
- Recommendation: Collaborate with other campuses to offer lower-division engineering specialty courses online via a rotating assignment schedule that distributes the teaching load

in a fair but logistically and financially sustainable way [specifically: CEE 270, CEE 271, (one or more of EE 160/ICS 111/EE 110), EE 211, EE 213, EE 260, EE 296, and ME 213].

- Recommendation: Early College math offerings should continue as they have been beneficial to students' ability to complete an ASNS degree and transfer to 4-year universities.

Problem 5: Native Hawaiian Enrollment and Completion

Native Hawaiian (NH) enrollment and completers should increase. NH enrollment and completers average about 25% (Table 5 “NH Majors by Academic Year”). This compares somewhat favorably to the campus benchmark of 32% when considering NH students have been traditionally far under-represented in the sciences across the UH system. It is notable that the 5 degrees awarded in spring 2019 and 2020 represent the total number of ASNS degrees earned by Native Hawaiian students since the program started in 2014-2015.

Table 5: NH Majors by Academic Year

NH Majors by Academic Year	2017-2018	2018-2019	2019-2020
Total ASNS Majors	32	42	43
Native Hawaiian (#)	7	12	8
Native Hawaiian (%)	22%	29%	19%

Impact of problem 5

There is a cycle of under-representation of Hawaiians in science. Both STEM graduates and NH graduates are performance metrics.

Solutions to problem 5

KauCC is part of a multi-campus National Science Foundation award, Hālau Ola Honua (HOH), to increase NH students in geosciences. KauCC hired a physics instructor and “Environmental Science Specialist” 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 efforts are summarized in:

- 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 Hawaiian Students: A Progress Update." American Geophysical Union Fall Meeting, Dec. 2018, Abstract [ED22A-03](#).

The grant helped KauCC identify a pathway for science students, particularly NH students, interested in transfer to four-year university programs in agriculture, environmental sciences, and natural resources management.

A new PAR was submitted in fall 2020 (for fall 2021 implementation) to establish:

- A new ASNS concentration in Agricultural and Environmental Science (AESC) to capture students, particularly NH students, who otherwise might not pursue a degree in STEM.
- It is hoped the AESC concentration can attract students who might not otherwise pursue a STEM career, help meet student and community needs, and build a more robust ASNS program.
- Adding an AESC concentration offers a guiding degree pathway for CC students that better aligns for transfer to 4-yr programs in Ag, Environ. Science, and Natural Resources.
- Outreach to other ASNS programs and key faculty in target bachelor degree programs to help obtain UH system approval to formally add new concentration.

Actions and Recommendations Related to Campus Mission and Goals

The actions and recommendations for improvement above involve the campus mission and strategic goals such as increasing graduates and transfer while reducing time to completion (problems 1,2, and 4), increasing STEM degrees (problem 4), increasing NH graduates (problem 5), and serving our community and its workforce needs (problems 4 and 5). Increasing efficiency (problem 3) will help fulfill these goals. The actions and recommendations will continue to guide the program, with annual reflection and updates, through the **next Comprehensive Review in 2024**.

5. Resource Implications

We are NOT requesting additional resources for my program/unit.