Associate of Science in Natural Science

ANNUAL
REPORT OF PROGRAM DATA
2021

UNIVERSITY of HAWAI'I®
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 careers in science, technology, engineering, and mathematics (STEM). 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. Students can use the AS degree in Natural Science to better market their science background for a science technician position or transfer to a four-year institution and prepare to join a larger and stronger STEM workforce in Hawai‘i.

2. Analysis of the Program/Unit

Residents of Kaua‘i depend on Kaua‘i CC (KauCC) because it is the only institution of higher learning on Kaua‘i. We continue providing Kaua‘i residents with the quality education needed to pursue important STEM careers to Kaua‘i and Hawai‘i. 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.

The 2020-2021 academic year is the second full year since the ASNS program at KauCC was formally upgraded from “provisional” to “established” by the UH Board of Regents in spring 2019. Instructional program ARPD Program Quantitative Indicators include various data. Key metrics from the ARPD are included in **Tables 1-3**. Only the indicators denoted by two stars (**) are used by the UH system to categorize program health. The metrics provide some indication of the condition of the program; a single number is overly simplistic. Further context may help to understand the numbers or consider trends. Additionally, impacts of the COVID-19 pandemic complicate interpretation.

Table 1:ARPD Key Demand Indicators

Demand Indicators	2018 -19	2019 -20	2020 -21
Number of Majors	42	43	41
**** Percent Change Majors from Prior Year**	**30%**	**2%**	**-5%**

Demand Indicators: Enrollment in fall 2021 is down 5%. Enrollment increased by 30% in 2018-2019 and by 2% in 2019-2020. Demand is listed as “Needs Attention” because growth is below the target set by the UHCC system. We continue to explore ways to improve enrollment and be accountable. There is some context for the trends to consider. Enrollment decreased in fall 2021 across KauCC generally and in our Liberal Arts program, the main pre-professional transfer program at KauCC. Enrollment in the ASNS has essentially stabilized over the last three years (one less student in the ASNS program in fall 2021 than

fall 2019). The small decline may be part of an island-wide trend due to COVID or something different altogether. National trends of declining community college enrollment of 15% since 2019 have been attributed to both fewer high school graduates and a reduced share of graduates opting for college. On Kaua‘i, a demographic shift toward fewer young adults makes it more challenging to increase enrollment. Almost all ASNS program students are aged 15-29 years old. The 15-29 year old demographic on Kaua‘i has decreased in population by 2% from 2018 to 2020, according to 2020 census data. Ideally, we’d like to see a “supply side” comparison of whether we are enrolling a larger percentage of local high school graduates each year. But the most recent data we could find for high school graduates on Kaua‘i was for 2018.

Table 2: ARPD Key Efficiency Indicators

Efficiency Indicators	2018-19	2019-20	2020-21
Average Class Size	13	13	15
**** Fill Rate**	**54.5%**	**55%**	**63.2%**
FTE BOR Appointed Faculty	5	5	5
**** Majors to FTE BOR Appointed Faculty**	**8**	**8**	**8**
Majors to Analytic FTE Faculty	8	10	13
Analytic FTE Faculty	5	4	3
Number of Low-Enrolled (<10) Classes	12	15	6

Efficiency Indicators: Efficiency rating of “Progressing” is based on two metrics: Fill Rate and Majors to FTE BOR Appointed Faculty. The program has improved in both areas. Fill rates have gradually increased in each of the last three years, from 54.5% to 63.2%. And average class size has increased from 13 to 15. We made a conscious effort to reduce low-enrolled courses, which have been reduced by more than half (from 15 to 6). For example, our visionary math faculty created an accelerated advanced calculus course, MATH 253, which covers the entire second year of calculus (MATH 243 and MATH 244) in one semester. MATH 253 eliminates the need to offer the traditionally low-enrolled MATH 244. Preliminary results suggest the change has also led to a higher success rate of student completers. And the students finish in just one semester instead of two. We can all embrace such win-win-win solutions.

Majors to FTE (Full Time Equivalent) BOR Appointed Faculty and FTE BOR Appointed Faculty have remained steady at 8 and 5, respectively. But all BOR Appointed faculty teaching in the ASNS program also teach a significant number of courses outside the ASNS program. A better metric of efficiency is the Majors to Analytic FTE Faculty, which is based more closely on the share of faculty load dedicated to teaching students in the ASNS program. The number of Analytic FTE Faculty has decreased from 5 to 3 from 2018-19 to 2020-21. Likewise, the number of Majors to Analytic FTE Faculty has increased from 8 to 13 over this time period.

Table 3: ARPD Key Effectiveness Indicators

Effectiveness Indicators	2018-19	2019-20	2020-21
Successful Completion (C or Higher)	86%	89%	82%
Withdrawals (Grade = W)	28	18	14
**** Persistence Fall to Spring**	**69%**	**79%**	**68%**
Persistence Fall to Fall	36%	44%	41%
Unduplicated Degrees	11	7	7
Associate Degrees Awarded	13	8	8
Transfers to UH 4-yr	2	10	12
Transfers with program degree	0	6	3
Transfers without program degree	2	4	9

Effectiveness Indicators: Effectiveness indicators show mixed signals, some signs of hope, and belie logistical and administrative challenges. The official rating is "Progressing" based on the single metric of fall to spring persistence. Fall to spring persistence went from 69% (2018-19) to 79% (2019-20) to 68% (2020-21). The 10% up and down swings make one wonder whether the changes are random or due to the pandemic, e.g., changes in work or financial situation, shift to online instruction, etc.

Other important considerations are the number of degrees awarded and transfers to UH 4-yr institutions. Degrees awarded remained flat at 8 (7 unduplicated). The number of transfers to UH 4-yr programs increased from 10 to 12. The key piece of information is the disparity in transfers with vs without the degree (3 vs 9). Structural and logistical barriers thwart degree completion, though there can be many different reasons specific to individual students. The barriers to degree completion and efforts to overcome them are addressed in the action plan.

3. Program Student Learning Outcomes or Unit/Service 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) Program or Unit/Service Outcomes that have been assessed in the year of this Annual Review.

Table 4 PSLO Assessment Metrics

PSLO Assessment	Metrics recently used
1. Analyze data effectively using currently available technology.	Assessed in PHYS 170L: Partially subjective evaluation of student analysis, e.g., Model sine/cosine wave using data and computer program; relate result to gravitational acceleration of unknown planet An individual student meets the benchmark by scoring 75% or greater on the relevant questions
2. Communicate scientific ideas and principles clearly and effectively.	Assessed in PHYS 272L: Subjective analysis of scientific writing, e.g., Rubric on detailed laboratory write up An individual student meets the benchmark by scoring 75% or greater on the relevant questions
3. Analyze and apply fundamental mathematical, physical, and chemical concepts and techniques to scientific issues.	Assessed in PHYS 170L/272L: Longitudinal objective assessment, e.g., assessment of improvement in student learning for 2-D vector addition problem presented in PHYS 170L compared with results in PHYS 272L
4. Apply fundamental concepts and techniques in their chosen natural science field of study, such as biology, chemistry, engineering, physics, etc	Not Assessed

c) Assessment Results.

Table 5 PSLO Assessment Results

PSLO Assessment	% Met Benchmark 2021 (2020 result)	Comments
1. Analyze data effectively using currently available technology.	61% (87% in 2020)	2nd implementation of this assessment with minor changes due to pandemic; two of 13 students did not take the assessment in 2021 (all 15 students did in 2020). 73% of students taking the assessment met the benchmark, with three

		of the 11 barely missing with scores of 73, 73, and 71. Students must score 75% or higher to meet the benchmark. Recommendation: Keep assessment and compare to 2022-23 data; better adapt to online format
2. Communicate scientific ideas and principles clearly and effectively.	79% (60% in 2020)	Assessment adapted in each of the last three years due to the pandemic, though the essence of the assessment remains. All students taking the assessment met the benchmark. Three of 13 students did not take the assessment. Recommendation: Better adapt assessment and implement in PHYS 272L as intended pre-pandemic
3. Analyze and apply fundamental mathematical, physical, and chemical concepts and techniques to scientific issues.	100% (N/A in 2020)	Longitudinal study: Only students completing the metric in both courses (PHYS 170L and PHYS 272L) were considered. Reconfigured assessment for online 272L course. Attempted returned to pre-pandemic metric, still having some difficulty due to changed format. Recommendation: Better adapt assessment and implement across PHYS 170L and PHYS 272L.

d) The value of program assessment comes from the process of carefully considering what students should learn and how to assess student learning. Assessments are still being adapted. Changes in response to program assessment are mostly about how to adapt assessments in COVID-times as noted in Table 5. Program assessment plans were altered in the 2019-2020 academic year. 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. Assessment plans were further adapted for 2020-2021 as noted. PHYS 272L is an ideal course to run summative program assessments since students in all ASNS concentrations must take this course and it is generally taken in their last semester at KauCC.

   The Action Plan details issues of concern and strategies to address them. But these are not as a result of assessment of student learning. The total number of students in the program taking summative assessment and year-to-year changes in percent of students meeting benchmarks are too small to draw meaningful conclusions. The changes are not statistically significant and defy interpretation, though the results certainly don't raise

any “red flags.” The total number of students completing the summative assessment in PHYS 272L is reasonable; it is similar to the number of transfers to 4-yr UH institutions. It is clear some KauCC are not assessed because not all ASNS students take PHYS 272L at KauCC before transferring within Hawai‘i or out of state.

4. Action Plan

The following actions have recently or will be taken to promote program health.

a) Early College ASNS courses

KauCC will offer several Early College ASNS courses in the 2021-2022 academic year. Early College ASNS courses have many benefits. Students benefit from instruction and course design by a disciplinary expert, students get college credit, and make progress toward an ASNS degree. In the process, they also become more familiar with college in general and KauCC and its faculty in particular. They learn about other courses academic pathways available. Indeed, they begin to make progress specifically toward their ASNS degree.

Early College (and accelerated) math offerings should continue as they have been beneficial to students’ ability to complete an ASNS degree and transfer to 4-year universities. There is little doubt the availability of Early College and accelerated math offerings has benefitted students and all metrics of ASNS program health. Several math courses have already been offered via Early College for a few years and proved instrumental in boosting awareness, college readiness, and enrollment and success in the KauCC ASNS program. MATH 103: College Algebra and MATH 140X: Precalculus prepare students along the STEM track and provide the basic fundamentals students need for STEM careers. They are the prerequisite courses students need for specific ASNS courses -- MATH 241: Calculus, which is also offered as an Early College option at both high schools.

In the spring 2022 semester, KauCC will offer Early College ASNS science courses, PHYS 151/151L at Kapa‘a High School and SCI 170 at Waimea High School. This will be just the second time PHYS 151/151L has been offered at Kapa‘a High School; the first was in spring 2021. SCI 170 will be offered for the first time at Waimea High School.

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.

b) SCI 170: STEMinar

The SCI 170 course was specifically designed and adapted to address effectiveness issues. It became a required part of the ASNS curriculum in fall 2020. SCI 170 is a 1-credit seminar that introduces students to academic pathways and career possibilities in STEM,

along with STEM concepts to help with career readiness. All students map out their 4-yr course plan for their prospective BS degree. SCI 170 has helped ensure students' near and long-term course plan matches their ambitions, especially considering our limited offerings. The course helps identify potential issues for students in their first semester. They benefit from the opportunity to discuss their options going forward with a STEM faculty member. There are several key considerations students generally don't know. For example, students gain 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 both fall 2020 and fall 2021 changed their current or near-future academic plans based on activities and feedback as part of the course. In many cases, students avoided a superfluous course or saved a semester or more by enrolling more strategically in courses that are prerequisites or part of a sequence.

c) Collaboration with UHCC on key engineering courses

The KauCC ASNS coordinator collaborated as part of a UHCC ASNS working group to coordinate online offerings of key lower-division courses required by many engineering degrees that are difficult to offer at all UHCCs. For example, EE 160: Programming for Engineers fulfills a specific requirement for seven all engineering majors at UH Manoa. EE 160 is also a prerequisite for other lower-division and many "third-year" engineering courses. But lack of available faculty or lack of sufficient students (or both) prevent most UHCC's from offering EE 160 and other, similarly important courses. The impact on students can be profound; transfer students may be delayed in their pursuit of a 4-yr degree by a semester or more. EE 160 is a required part of KauCC's ASNS engineering concentration curriculum. Yet have seldom offered the course at all, which is one key reason KauCC students transfer without receiving their ASNS degree.

The UHCC ASNS working group's goals were to:

- Strengthen and maintain effective 2-yr science degree (i.e., more graduates completing degrees in a timely manner with skills they need to successfully complete a STEM bachelor's degree)
- Reduce costs associated with low-enrolled courses
- Maintain or increase the breadth of offerings needed to complete degrees in ASNS concentrations

The group developed a plan to ensure all UHCC students have access to at least one online section each year of key courses. The students will gain access even though some individual campuses would not have offered the courses. The plan actually increases the breadth and regularity of essential course offerings, especially through improved regular access to EE 160 and EE 211. KauCC students now have clear options to take EE 160 every year; Further, EE 160 is a computer language course that is especially amenable to online instruction without concern for compromised quality.

Additionally, KauCC engineering students will have access to other key courses that have never been offered at KauCC, e.g. civil engineering courses like CE 270. The plan maintains or enhances course experience and instruction quality through collaboration to

allow hands-on access to KauCC lab facilities for EE 211 taken online through UHMC. KauCC electronics instructor, Geogeanne Purvinis, worked out the collaboration with UHMC and graciously offered her time and expertise to prospective students.

d) Continue Pursuing Federal Grants and UH Foundation Funds

External grants and funds have helped prepare our students for STEM careers, extend or maintain STEM course offerings, equip our labs with high-quality supplies, offer meaningful hands-on labs despite remote learning conditions during the pandemic, and encouraged and supported Native Hawaiian and other students in pursuit of undergraduate research experiences.

ASNS students have benefitted from a dedicated UH Foundation fund annual donation, NSF Partnerships in Geoscience Education (PAGE) award, and NSF Louis Stokes Alliances for Minority Participation (LSAMP) award. But all three sources of funding were for fixed terms that have ended, with no new funds delivered after spring 2022. Though the program has applied for a no-cost extension, we effectively lost a full-time physics instructor and "Environmental Science Specialist" hired through the PAGE award. The addition of a third physical scientist who can teach core ASNS physics courses (PHYS 170/170L, PHYS 272/272L) had 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.

VCAA Frankie Harriss and the ASNS faculty coordinator, Stephen Taylor, are applying to renew an NSF grant covering the next three years (2022-2025). A renewed LSAMP grant will help fund stipends and supplies for Native Hawaiian and other groups designated as under-represented minorities to engage in research experiences. The effort will encourage participation, program completion, and career readiness – especially for Native Hawaiian, Pacific Islander, and Filipino/Hispanic students who comprise the bulk of the qualifying minority population at KauCC.

e) Continue Identifying Logistical Barriers to Completion

Effort will be needed to identify and overcome logistical barriers to completion. SCI 170 and an active, engaged ASNS academic counselor (Wade Tanaka has been wonderful) will ensure students are on the right pathway. But there remain logistical barriers across the campus and UH system, which can be difficult to anticipate, expose, and/or fix.

There will need to be more consideration and effort to coordinate curriculum issues within and between campuses. Within our campus, the course catalogue, KauCC website, STAR GPS, and scheduling systems do not necessarily talk to each other. It is likely information is left out of any one of these systems when a change happens. Inter-department requirements are also not coordinated, and there is no technical or computer program "check" to make sure a student can take required courses (e.g., some required courses may not be offered or students may always have time conflict between required courses). Issues

can arise even years later. A recent example: a student initially did not get credit for calculus (MATH 241) because it was numbered MATH 205 when they took it years earlier. The original number of 205 was switched to 241 a few years ago to match UH Manoa's numbering. Somehow, MATH 205 was not applied properly toward their ASNS degree. The issue was only identified and resolved by intentional and exploratory efforts of the student, KauCC faculty, and KauCC staff.

The new online coordination of the UHCC working group along with the increase in online offerings has improved access but raised other issues of UH system coordination affecting students. For example, the accelerated second year calculus course, MATH 253, has been successful by any measure. Completion rates improved, students finished in one semester instead of two, and a low-enrolled course (MATH 244) was averted. Further, UH Manoa's engineering department wrote an official letter accepting KauCC's MATH 253 in lieu of MATH 243 and MATH 244. But other UHCC's don't have or recognize KauCC's MATH 253. A KauCC student wishing to take EE 211 online at a different UHCC campus won't have the required corequisite (MATH 243) even though they completed or are currently taking MATH 253 at KauCC. It seems constant vigilance is required to identify, understand, and resolve barriers to timely student completion.

In summary, the actions and recommendations for improvement outlined in the Action Plan [all parts a) - e) above] involve the campus mission and strategic goals such as increasing graduates and transfers while reducing time to completion, increasing STEM degrees, increasing Native Hawaiian graduates, and serving our community and its workforce needs. The actions and recommendations will continue to guide the program, with annual reflection and updates, through the next Comprehensive Review to be submitted in fall 2023.

5. Resource Implications

1) **One (1) FTE Physics instructional position.** This position was on track to be institutionalized from an expiring grant-funded position, but the COVID-19 hiring freeze meant that this plan was not implemented. The need for a second physical science instructor remains the same. This position is also being requested by the AA-Liberal Arts program. **COST: salary and fringe benefits for one instructor. PROGRAM GOALS: #1-7, 12**

2) **Replace cabinets and shelving in NSCI 107 and 101.** The fixtures in these two rooms are nearing their end of life and will need to be replaced soon. Several of the cabinets are falling apart and some of the counterspace has holes in it. Recently installed electrical outlets are no longer firmly attached to the lab stations because the integrity of the material has been compromised. This minor renovation will alleviate the safety issues posed by the existing cabinets. This replacement is also being requested by the AA-Liberal Arts program.**COST: $8000-$12,000, per estimate by Pat Watase for similar work performed last year in another classroom. This would be for a bin for disposal, paint, flooring, and baseboards . PROGRAM GOAL: #12**

3) Further resources are requested to renovate the NSCI 107 classroom. Legacy gas lines used to feed Bunsen burners are obsolete and a potential hazard. Central consoles for gas burners and sinks along each row restrict instructional flexibility and are superfluous. These can be removed along with the gas lines and the classroom refurbished. An updated estimate may be needed. Estimates of sink and gas line removal and renovation will depend greatly on details, e.g., which current building codes are relevant, whether engineering drawing or emergency shut-off valves are needed, etc. **PROGRAM GOAL: #12**

6. Optional: Edits to Occupation List for Instructional Programs

None.