



Natural Science

1. Program or Unit Description

Program description

The Associate in Science degree in Natural Science (ASNS) provides a comprehensive background in science and math designed specifically for students who plan to pursue baccalaureate studies in science, technology, engineering, and mathematics (STEM), or who plan to continue with professional studies, such as pre-pharmacy, pre-medical, or pre-dental programs. The ASNS curriculum provides a seamless pathway for students intending to transfer into a STEM degree at a four-year institution, in particular within the UH system where students may take advantage of transfer agreements with UH Mānoa, UH Hilo, and UH West O‘ahu. Students may choose to concentrate in biological sciences (BS), physical sciences (PS), engineering (Eng), or information and communication technology (ICT).

Target student population

The program targets high school students and returning students interested in STEM-related fields and planning to transfer to a 4-year institution.

Articulated pathways for 4-year institution

A Memorandum of Agreement (MOA) exists between the University of Hawai‘i Community Colleges (including the University of Hawai‘i Maui College) and the University of Hawai‘i at Mānoa. The purpose of this agreement is to facilitate the transfer of students who complete the ASNS degree with an Engineering Concentration at participating University of Hawai‘i Community College campuses to the University of Hawai‘i at Mānoa (UHM) College of Engineering. This agreement is intended to streamline the transfer process, increase the number of students in the Engineering program pipeline, and ease the transition for transfer students to support timely degree completion.

The Equity Gap

The Natural Science (NSCI) program is overall strong. However, female are underrepresented. The small percentage of Native Hawaiians who graduate with the ASNS compared to UHMC’s percentage of Native Hawaiians who graduate with an Associate’s degree constitutes another weakness of the program.

- **The gender gap**

Table 1 below shows the total number of NSCI majors, the number of Native Hawaiian NSCI majors, and the number of female NSCI majors for each year since Fall 2019.

Table 1. NSCI majors by gender and ethnicity, 2019-2021

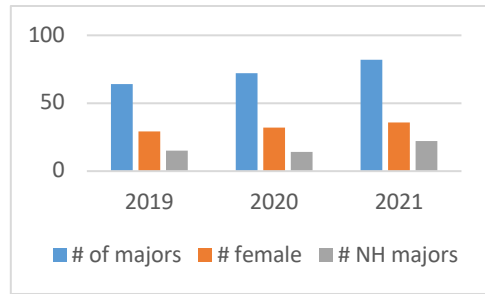


Table 1 shows that in 2021-2022, 44% of NSCI majors in all concentrations were female (same as the two previous years), which is below the percentage of female enrolled at UHMC* (60 %). This quick conclusion doesn't take into account the distribution of female among the four concentrations, which is uneven as shown in table 2 below.

*Source: <https://data.hawaii.edu/#/home>

Table 2. Percentages of female in NSCI concentrations in Fall 2021.

Biological Sciences	Engineering	Physical Sciences	Information & Communication Technology
69%	15%	22%	25%

Table 2 shows that the percentage of female in the Biological Sciences concentration was 69%, above the percentage of female enrolled at UHMC, while the percentage of female in the other concentrations was below 25%. This means that in order to reduce the gender gap in the NSCI program, it is necessary to recruit more female students in the three other concentrations.

- Native Hawaiians awarded the ASNS

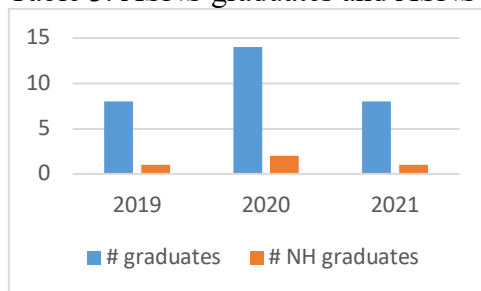
Data from table 1 shows that since 2019 the number of Native Hawaiians in the NSCI program has increased (Likely following the increase in the total number of NSCI majors). In 2021-2022, 27% of the total number of NSCI majors were Native Hawaiians, which is very close to the average percentage of Native Hawaiians enrolled at Maui College* (30%), so recruitment is not the main issue.

*Source: <https://data.hawaii.edu/#/home>

- ASNS graduates vs Native Hawaiians ASNS graduates

Table 3 below shows the total number of ASNS graduates as well as the number of Native Hawaiians who graduated with the ASNS.

Table 3. ASNS graduates and ASNS Native Hawaiian graduates, 2019-2021.



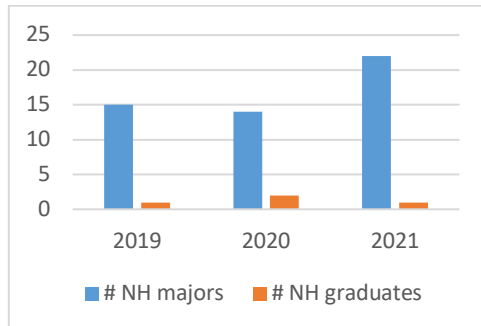
One Native Hawaiian student graduated with the ASNS in Spring 2022 (2 in 2021, and 1 in 2020), which brings to 13% the percentage of Native Hawaiians who graduated with the ASNS, below the percentage of Native Hawaiian students who are awarded an associate's degree at UHMC* (30% for the academic year 2021-2022).

*Source: <https://data.hawaii.edu/#/home>

- ASNS Native Hawaiian graduates vs Native Hawaiians in the NSCI program

Table 4 below displays the number of Native Hawaiians enrolled in the NSCI program and the number of Native Hawaiians who graduated with the ASNS over the past three years.

Table 4. Number of Native Hawaiians completing the ASNS degree



Data from table 4 show that only a small number of Native Hawaiians, one or two, i.e., between 5% and 14% make it to the ASNS: They drop the program before they graduate.

Tables 3 and 4 demonstrate that there is an equity gap for Native Hawaiians in STEM that needs to be addressed, in particular in terms of retention (and therefore graduation). Native Hawaiian programs are there to help: Kāko'o (a Native Hawaiian support program), Ka Hikina o Ka Lā (a specialized program at UHMC funded by the National Science Foundation in response to the application to erect the Daniel K. Inouye Solar Telescope upon the summit of Haleakala), Ho'okahua/Kekaulike (a Native Hawaiian support services), Mu'o A'e (a Native Hawaiian success program), and Kaiao (a Native Hawaiian Student Success Program under a new Title III Grant).

Besides the support from Native Hawaiian programs, UHMC has been awarded numerous grants over the years to help close the equity gap in STEM due to ethnicity, including two S-STEM grants: a \$1.6 million grant awarded in 2019 and another \$2.6 million awarded in 2021. Both grants (Project Kaihuwa'a and Project Kaihuwa'a II) funded by the National Science Foundation, strive to increase the success of low-income academically talented students with demonstrated financial need pursuing STEM programs (ECET and NSCI) at UHMC. The grants provide annual scholarships up to \$10,000 to eligible ECET and NSCI majors (to include Native Hawaiians) as well as support from faculty mentors. 28 scholarships have been awarded since 2019, with eight to NSCI Native Hawaiians (29%), five of them being female (for a total of 11 female). We hope that more NSCI students (low-income, Native Hawaiians, female) will apply, since the scholarships are a wonderful way to close the equity gap due to income and ethnicity.

2. Analysis of the Program/Unit

The overall Natural Science Program health, as indicated in the ARPD, is identified as Progressing, an improvement from last year when it was rated cautionary.

Demand Indicator: Healthy

#	Demand Indicators	2019-20	2020-21	2021-22
1.	Number of Majors ?	64	72	82
1a.	Number of Majors Native Hawaiian	15	14	22
1b.	Fall Full-Time	54%	43%	32%
1c.	Fall Part-Time	46%	57%	68%
1d.	Fall Part-Time who are Full-Time in System	9%	14%	25%
1e.	Spring Full-Time	42%	26%	24%
1f.	Spring Part-Time	58%	74%	76%
1g.	Spring Part-Time who are Full-Time in System	12%	25%	40%
2.*	Percent Change Majors from Prior Year	44%	13%	14%
3.	SSH Program Majors in Program Classes	237	134	269
4.	SSH Non-Majors in Program Classes	587	582	370
5.	SSH in All Program Classes	824	716	639
6.	FTE Enrollment in Program Classes	27	24	21
7.	Total Number of Classes Taught	22	16	21
Demand Health		Healthy		

The demand health is the same as last year. The number of majors increased by 14% (almost the same increase as last year's).

Efficiency Indicator: Progressing

#	Efficiency Indicators	2019-20	2020-21	2021-22
8.	Average Class Size	17	21	14
9.*	Fill Rate	78.1%	83.3%	68.5%
10.	FTE BOR Appointed Faculty	2	2	2
11.*	Majors to FTE BOR Appointed Faculty	31	35	40
12.	Majors to Analytic FTE Faculty	31	71	81
12a.	Analytic FTE Faculty	2	1	1
13.	Overall Program Expenditures	\$830,018	\$802,423	\$768,027
13a.	General Funded Budget Allocation	\$788,399	\$781,228	\$753,966
13b.	Special/Federal Budget Allocation	0	0	0
13c.	Tuition and Fees	\$41,619	\$21,195	\$14,061
14.	Cost per SSH	\$1007	\$1121	\$1202
15.	Number of Low-Enrolled (<10) Classes	2	1	6
Efficiency Health		Progressing		

The efficiency health is the same as last year.

The average class size and the class fill rate have decreased in 2021. On the other hand, due to the increase in the number of majors, the majors to FTE BOR appointed faculty has increased. Those results seem contradictory, but are a consequence of the change in class modality initiated with Covid-19. In Spring 2019 and Fall 2020, all classes were offered online UHMC offered online, and UHMC students discovered this new class modality. Starting in Spring 2020, when UHMC was

back offering in-person classes, students learned how to “shop” for online classes. They did not hesitate to take advantage of the UH system and registered at other UH campuses that offered online classes when UHMC would offer in-person classes only. We believe that students enroll in classes required for the ASNS not only at UHMC but also on the other UH campuses, lowering the fill rate and the average class size.

Effectiveness Indicator: Progressing

#	Effectiveness Indicators	2019-20	2020-21	2021-22
16.	Successful Completion (Equivalent C or Higher)	78%	83%	79%
17.	Withdrawals (Grade = W)	33	21	27
18.*	Persistence Fall to Spring	69%	74%	71%
18a.	Persistence Fall to Fall	45%	47%	46%
19.*	Unduplicated Degrees/Certificates Awarded Prior Fiscal Year ?	7	14	8
19a.	Associate Degrees Awarded	8	14	8
19b.	Academic Subject Certificates Awarded	0	0	0
19c.	Goal	0	0	0
19d.	Difference Between Unduplicated Awarded and Goal	0	1	1
20.	Transfers to UH 4-yr	7	14	12
20a.	Transfers with degree from program	1	9	9
20b.	Transfers without degree from program	6	5	3
20c.	Increase by 3% Annual Transfers to UH 4-yr Goal			
20d.	Difference Between Transfers and Goal			
	Effectiveness Health	Progressing		

The effectiveness indicator is the same as last year. Persistence (Fall to Spring and Fall to Fall) has been consistent over the last three years. The percentage of graduates who transfer to a 4-year institution has consistently increased: It went from 14% in 2019, to 64% in 2020, to 75% in 2021. Without any doubt we can consider this result as a strength of the NSCI program.

Conclusion

In terms of enrollment, persistence, graduation, and transfer to 4-year institutions, data from the last three years show positive outcomes and promising results for the future that are due to a combination of dedicated faculty and lecturers, committed counselors, and grants that support students enrolled in the NSCI program.

3. Program Student Learning Outcomes or Unit/Service Outcomes

a) Program Student Learning Outcomes

PLO1. Explain the natural and technological world using reflection and quantitative analysis including preparation of a plan to collect, process, and interpret data; evaluation of the plan, procedures, and findings; and communication of the conclusions;

PLO2. Explain scientific knowledge and understanding to different audiences for a range of purposes; and

PLO3. Apply scientific knowledge, skills, and understandings to problems and issues in daily life.

b) Program Outcomes that have been assessed in the year of this Annual Review.

MATH 241, Calculus I, a requirement for ASNS graduation for all concentrations, has been assessed. Student Learning Outcomes (SLOs), Program Learning Outcome (PLO) and College-wide Academic Student Learning Outcome (CASLO) are listed below.

SLO 1: Choose and apply appropriate formulas or algorithms to compute limits, derivatives, definite integrals and indefinite integrals of elementary functions

SLO 2: Solve application problems involving derivatives and integrals of these functions, including but not limited to, curve sketching, related rates, optimization, and areas under or between curves

SLO 3: Demonstrate effective use of technology in solving such problems

SLO 4: Communicate the solution of such problems using standard English, numeric, graphic, and symbolic representations.

NSCI PLO 3. Apply scientific knowledge, skills, and understandings to problems and issues in daily life.

CASLO Standard 2: Quantitative Reasoning (QR)

c) Assessment Results.

Assignment: Fall 2021 Q04

Topics covered: implicit differentiation

Nineteen students completed the assignment, with fifteen students (about 79%) earning a perfect 10/10, one student scoring 9/10, one student scoring 8/10, and two students scoring 7/10. Students were instructed to submit a screenshot of their desmos.com results illustrating that the equations they find in the final problem do in fact represent the tangent lines they were asked to derive. Using Desmos to graph the solutions reinforces their geometric understanding of what they are computing algebraically, while at the same time familiarizing them with a very useful and completely free online graphing calculator tool. This also helps students catch and correct any mistakes before submitting their work to be graded.

d) Changes that have been made as a result of the assessment results.

Results were satisfactory. No changes were made.

4. Action Plan

The NSCI program has shown a positive trend for the last three years. Our action plan for next year includes the following:

1. First action plan: Recruitment and retention

- Counseling department

Continue working with counselors to promote the NSCI program at high school fairs for recruitment purposes, and identify among UHMC's LBRT students those who should declare NSCI as their major. Due to administrative hurdles, we were not able to hire a part-time assistant to help the NSCI counselor using grant money.

- Workshops

Starting in Fall 2022, in order to retain students in the NSCI program, and in particular attract female in the NSCI engineering, physical sciences, and information and communication technology concentrations, UHMC faculty will offer workshops that focus on programming languages (Introduction to Python and Matlab), computer aided design application (Such as SolidWorks), and working with a physical programmable circuit board (Such as Arduino). Our intention is to offer the workshops to high school students in Spring 2023. The workshops are funded by the Project Kaihuwa'a II grant.

2. Second action plan: ASNS classes

- Continue monitoring the offering of classes each semester to avoid scheduling conflicts.

- The NSCI program was updated in Kualu to add ICS 173 and SCI 295v as concentration electives.

- In Fall 2021, many NSCI classes that were exclusively offered online in Spring 2020 switched to in-person or hybrid. In this process UHMC lost too many students: those who preferred online classes would register at UH campuses who offered online classes (Lectures and labs) instead of registering for in-person classes at UHMC. Therefore, to avoid losing students and accommodate all students' preferences, starting in Fall 2022, UHMC will offer the same class both in-person and online (When possible).

As of today, the majority of courses required for the ASNS (all four concentrations) are offered at UHMC, with different class delivery methods: Some classes are offered in-person, some are hybrid, some online, and some both in-person and online.

- SCI 295v, STEM Research Experience, has been offered each semester, from Spring 2019- Spring 2022: it is a valuable hands-on course where students apply what they learn, and a means to keep them in the program. However, this class has been historically low-enrolled and offered only if it is funded by a grant. This class won't be offered in Fall Spring 2023, since there is no grant funding.

3. Third action plan: website and catalog

The website has been updated in F21-S22. We will continue updating the NSCI website with relevant and current information, as it is a reference and a means to promote the program and recruit students.

4. Fourth action plan: recruitment and support for NSCI majors through grants

Continuing effort from UHMC faculty to promote projects that support NSCI majors, as a means to recruit students for the NSCI program, retain students in the NSCI program, and transfer students to 4-year institutions.

- Project Kaihuwa'a and Project Kaihuwa'a II grants provide annual scholarships up to \$10,000

to low-income academically talented students with demonstrated financial need pursuing STEM degrees, i.e., ASNS and AS ECET at UHMC. 28 NSCI majors (14 engineering, eight BS, four ICT, and two PS) have been awarded the scholarships since 2019: four graduated with the ASNS and transferred to UH Mānoa (three) and UH Hilo (one), and 18 are still receiving the scholarships. KSP scholarships were awarded to eight Native Hawaiians, five of them being female for a total of 11 female.

- The IDeA Networks of Biomedical Research Excellence (INBRE) grant provides NSCI majors an opportunity to participate in a research project and apply what they learn.
- Bridge to the Baccalaureate (B2B) grant: provides stipends to Native Hawaiian and other underrepresented students transferring annually into baccalaureate STEM degree programs. Students participate in a research project or provide peer mentoring.
- The Hawaii Society of Professional Engineers (HSPE) Maui Chapter awards up to three scholarships of \$1,500 each annually to students entering an accredited college of engineering.

5. Resource Implications

We would like to request that the MATH position be filled. This position is crucial to meeting the needs of students in the NSCI program as well as all students enrolled at UHMC.

x I am NOT requesting additional resources for my program/unit.