Program Name:
Associate in Science in Natural Sciences (ASNS) Program

Assessment Period:
August of 2015 – May of 2020

College Mission:
At Leeward Community College, we work together to nurture and inspire all students. We help them attain their goals through high-quality liberal arts and career and technical education. We foster students to become responsible global citizens locally, nationally, and internationally. We advance the educational goals of all students with a special commitment to Native Hawaiians.

Program Mission
The ASNS Program at Leeward Community College offers our students the opportunity to complete the course works in one of the STEM concentrations: Biological Sciences, Engineering, Information and Communications Technology, and Physical Sciences. The program mission is to provide a clear two-year pathway toward the baccalaureate STEM degrees at UH and other 4-year institutions.

Part I. Executive Summary of Program Status
The ASNS Program at Leeward CC started in 2012 and it has grown tremendously since then. Currently, our program is the second largest across the UHCC system with 389 students whose home-institutions are designated at Leeward. Similar to the ASNS program with an equivalent number of students, we have started to see the program reaching a potential plateau in terms of the number of students. By looking at all the indicators, the overall program health is determined as “cautionary” as it was based on data comparison from year to year. Despite this indication, the overall data indicate that we have more majors and non-majors students who are taking a full load of ASNS courses (e.g. 30 credits from fall to spring) with a steady persistence in their studies since 2015. In addition, we are seeing an increasing number of ASNS students who transferred to the UH system since 2016. These are strong evidence which supports and reflects the demand, efficiency, and effectiveness of the ASNS Program at Leeward CC.
In the first CRE, the ASNS Coordinator focused on 1) easing the transfer process by decoupling several ASNS courses where lectures and labs were combined at Leeward CC, 2) narrowing down the number of PLOs from 6 to 4, 3) collaborating with Hālau `Ike o Pu`uloa, 4) STEM Undergraduate Research Group Experience that are conducted at Leeward CC, and 5) increasing student enrollment. All of these action plans were aligned with the ASNS Program Mission. Several of the action plans were completed and the other will be discussed in this action plan as a long-term goals for the ASNS program.

The ASNS Program is designed to help our students follow a clear pathway to achieve their academic goals in STEM education. Our mission matches well with Leeward CC’s Vision where we are a learning-centered institution committed to student achievement. Our faculty and staffs strive to provide a high-quality education and a valuable learning experience to each of our student every step of the way. These actions are well aligned with Leeward CC’s Strategic Plan from 2015 to 2021. For example, many of our faculty in the Astronomy, Biology, Chemistry, and Math Disciplines had transitioned into using Open Educational Resources (OER) to reduce or eliminate the costs of textbooks for our students when possible.

Part II. Program Description

STEM education spans the fields of science, technology, engineering and math. For our students who are interested in pursuing a STEM education at Leeward Community College, the Associate in Science in Natural Science (ASNS) Program offers them a pathway to achieve this goal. We offer students the option of selecting one of the four concentrations: Biological Sciences (BS), Engineering (including CE/EE/ME), Information and Communications Technology (ICT), and Physical Sciences (PS). As our students complete their curriculum of 60 credits, they will fulfill the ASNS Program Learning Outcomes (PLOs).

Program Learning Outcomes:
PLO #1: Analyze data effectively using current technology.
PLO #2: Communicate scientific ideas and principles clearly and effectively.
PLO #3: Analyze and apply fundamental mathematical, physical, and chemical concepts and techniques to scientific issues.
PLO #4: Apply STEM concepts and techniques in one's chosen field of study, such as biology, chemistry, engineering, computer science, etc.

Admission Requirements:
The program has not had, nor plans to have, any admissions requirements.

Credentials/Licensures Offered:
The program has not offered, nor plans to offer, any credentials/licensures.

Student Population:
Our students have a diverse background in ethnicity. More importantly, we serve the largest population of Native Hawaiian students (i.e. 83 students during 2019/2020) at Leeward CC when compared to other ASNS programs across the UHCC system.

Resources:
We have 22 full-time faculty assigned to the ASNS program and along with a STEM counselor (see the ASNS Program website: http://www.leeward.hawaii.edu/asns). An APT in the Chemistry discipline and an APT in the Biology discipline provide tremendous instructional support for ASNS classes (among many others). The Program Coordinator is offered six credits of assigned time. Based on the most recent ARPD data, the ASNS program had received general funded budget allocation since 2017.

Articulation Agreements:
UH Manoa:
Prior to 2015, an agreement with the College of Engineering at UH Manoa was made to admit all students who graduate with the ASNS degree (i.e. the concentration in Pre-Engineering with a 2.0 GPA) into their engineering programs.

UH West O‘ahu:
An articulation agreement was also established between Leeward’s ASNS Program for students who graduate with a concentration in Information and Computer Technology to be admitted to UH-West O‘ahu Bachelor of Applied Science (BAS) with a concentration in Information Security and Assurance (ISA). See articulation agreement: https://westoahu.hawaii.edu/academics/articulations/. During 2019 to 2020, two new articulations have been established between Leeward CC and UH West Oahau (UHWO). This gives the ANSN students additional opportunities to work towards the Bachelor of Science degree in Natural Science (BSNS) or Health Sciences (BSHS) at UHWO (see articulation agreements: https://westoahu.hawaii.edu/academics/articulations/).

Community Connections, Advisory Committees, Internships, Co-ops:
None.

Modes of Course Delivery:
From 2015 to 2020, the majority of the ASNS courses were offered as face-to-face courses. We had 3 to 6 classes which were offered completely online each year. With the onset of the pandemic, all of the ASNS courses were transitioned to online delivery from the middle of March to May of 2020.

Part III. Analysis of Program Data

Demand Indicators
Since 2012, the ASNS Program at Leeward CC had grown tremendously from 0 students to 398 major students in 2015 (e.g. see line #1 Figure 1). Based on the annual data from 2015 to 2020, the demand indicators had fluctuated from 9% to -1% (e.g. see line #2 in Figure 1). Thus, the current program demand indicator was categorized as “unhealthy”. Since these data were generated by comparing the values from year to year, it is more meaningful to look at the overall range of the past five year in this
report (see Figure 2). In fact, we were seeing less dramatic changes in terms of the total number of ASNS major students since 2015. It is possible that our program at Leeward is reaching a plateau where the number of majors remained in the range of 390. A healthy indicator based on the UHCC Strategic Planning Goals would require a program to have a 3% or higher increase in the number of majors. Although we will strive to reach this goal, it may be a difficult task with the onset of the pandemic in spring of 2020 as well as the budget cut that follows in the near future.

Figure 1. Demand indicators of the ASNS Program at Leeward CC from 2011 to 2020.

In terms of the number of Native Hawaiian students in the ASNS Program, we had observed a steady number in the range of 80 since 2014. In 2018, there was a sharp increase of Native Hawaiian students from 86 to 101 which represented a 17% increase in number. However, we observed a drop of 21% from 101 to 83 students during the following year in 2019. This means that the Native Hawaiian students who started in the ASNS program in 2018 had discontinued their studies in STEM. This is very concerning. I will work with the Faculty and Counselor of the Hālau ʻIke o Puʻuloa and see how we can improve this situation. It will be vital to identify the courses where the students had a hard time in order to resolve this matter.

Figure 2. The number of ASNS majors and the number of Native Hawaiian majors of the ASNS Program from 2011 to 2020. Since 2015, we were seeing a trend where the program may reach a potential plateau in terms of the total number of ASNS majors and the number of Native Hawaiian students at Leeward.
Overall, the Full Time Equivalent (FTE) enrollment in Figure 3 shows that our ASNS program-majors and non-program majors were consistently taking the full load of ASNS courses (i.e. 30 credits per year) since 2012. The growing indication continued from 2015 to 2020. This was directly related to the 47% increase of the total number of classes that were offered by the Math and Sciences Divisions in the past five years (e.g. from 90 to 133 courses). Based on this information, our ASNS students were well supported by the Faculty and Staffs of the Math and Sciences Division since 2015.

![Demand Indicator of the ASNS Program at Leeward Since 2011](image)

Figure 3. Full Time Equivalent (FTE) Enrollment and the total number of ASNS classes taught at Leeward CC from 2011 to 2020. We saw a positive relationship between the FTE enrollment in program classes and the total number of classes taught.

Efficiency Indicators

In terms of the efficiency indicator, the ASNS program was categorized as “healthy” based on the class fill rate and the student-to-faculty ratio from 2015 to 2020. Since 2015, our average class size has consistently decreased from 23 students to 18 students (see Figures 4 and 5). From an instructional quality standpoint, that is a desirable metric since it provides a smaller student-to-teacher ratio thus giving faculty more ability to interact with each individual student. Although our fill rates had always been higher than 75% which was the benchmark, we did see a trend of declining fill rates from 92.1%, 84.4%, 79.5%, 77.3%, to 77.6%. This may be directly related to the overall decline of student enrollments at Leeward CC for the past 5 years. Further data analysis will be needed to determine if the overall enrollment at Leeward CC was a direct impact of the fill rate.
When it comes to the number of Board of Regents (BOR) appointed faculty assigned to the ASNS program, our number has been increased tremendously from 12 to 22 (see http://www.leeward.hawaii.edu/asns). In the past five years, we have hired new faculty in Chemistry, Engineering, Math, and Oceanography in replacement of the faculty who had retired or had terminated their employments. Our new faculty had been teaching a variety of Engineering, Chemistry, Math, and Oceanography courses to support the ASNS students and the ASNS program. The overall program expenditures have been listed and we saw an increasing trend of budget allocation from the general fund to support the ASNS program at Leeward. When compared to other ASNS program with the equivalent number of students, we are offering smaller student-to-faculty ratio and a wealth of ASNS courses because of the support from our college. We deeply appreciate the continuous support of our administrations in helping the ASNS students reach their academic goals. Many of the supports also came in the form of hiring Leeward students as tutors and assistants to help the ASNS students and faculty. In particular, the Chemistry Study Room and the Biology Open Lab are all successful stories of how we have been supporting our students in the ASNS Program at Leeward.

In terms of the low-enrolled classes, we were fortunate to have less of them when compared to other Leeward programs or other ASNS programs. For the academic year of 2019-2020, 16 low-enrolled courses were listed. Several of these courses have been identified, and we may work with other ASNS programs across the system in terms of taking turns to offer these low-enrolled courses (e.g. CE 270 and EE 260).

Figure 4. Efficiency indicators of the ASNS Program at Leeward CC from 2011 to 2020.
Based on this data, we were consistently offering smaller student-to-faculty ratio which is the optimal learning experience for students, especially since 2018.

Effectiveness Indicators

As for the effectiveness indicator, our program has been categorized as “cautionary” based on persistence, which indicates the percentage of program majors that remained during the past academic year. In fact, we had observed a steady percentage of persistence from fall to spring in the past five years (i.e. 67%, 68% and 65%) as well as the steady persistence from fall to fall (i.e. 41.5%, 42.1%, 38%, 41, and 40%). In addition, we have a successful completion rate that ranges from 76% to 71% where active program majors received the final grades of C or higher. This number has remained consistent for the past five years and this is a sign which reflects the challenging nature of the ASNS courses.
In terms of the number of withdrawals, we saw a downward trend from 183, 188, 155 to 147 since 2015 (see line 17 in Figure 6). But this number had increased dramatically from 147 to 226 in 2019. This was very concerning as it indicated a large number of students had withdrawn from their classes. It would be vital to identify these courses with the highest number of withdrawals and to see if it relates to the pandemic of COVID-19 in March of 2020. It might also be related to the drop in the number of Native Hawaiian students in this past year.

For this past year, our program has awarded 46 students with the ASNS Associate Degrees. However, we have been observing a decreasing trend since 2015 (i.e. from 68, 41, 58, 55 to 46 in line 19 in Figure 6). On the other hand, we have 79 students who transferred to the 4-year UH campuses which shows an overall increasing trend since 2017. Of those 79 students, it is notable that we observe a steady number of students (54 students) who transfer without the ASNS degree. It would be of interest to identify the specific concentration of those students who transferred without their degrees and to encourage them to do so.

Figure 7. Effectiveness indicators of the ASNS program at Leeward from 2011 to 2020. The data indicated that the program had maintained successful completion and persistence since 2015.

Distance Indicators

For the distance indicators, it is observed that the number of distance courses (i.e. completely online) ranged from 3 to 6 courses from 2015 to 2020. As a result, the enrollments in the DE courses also reflected those changes. Overall, the success rate has fluctuated from 64%, 74%, 83%, 69% to 64% since 2015. Although the number of withdrawals was lower in these online courses this year, this indicated that our students were trying hard while struggling in these DE courses. It would be important to identify these DE courses and to work with the Math and Sciences faculty on how to support them and the students with the needed teaching/learning tools. With the onset of COVID-19, the ASNS courses transitioned to distance learning from March to May of 2020. Although this transition was necessary for the safety and health of our students and faculty, it may have directly or indirectly affected the students’ performances in spring 2020 and their ability to graduate on time with their degrees.
Figure 8. Distance Indicators of the ASNS program from 2011 to 2020.

Performance Indicators

The last indicator of our program was focused on the program performance. Based on the data, the number of degrees that were awarded each year was about 10% to 14% of the total number of majors. For example, 46 degrees were awarded out of 389 majors during 2019/2020 and this represents about 12% of our students. In addition, 7 degrees out of 46 were awarded to Native Hawaiian students. With the decreasing trend, this may indicate that there are factors affecting our students in receiving their degrees within a two-year period. We did observe a sharp decrease in the number of students who were Pell Recipients from 167 to 17 since 2015. It would be of interest to find out what is affecting our students in getting their degrees.

Figure 9. Performance Indicators of the ASNS program from 2011 to 2020.
Part IV.A. Analysis of Program Level Outcomes (PLOs)

Based on the previous CRE-2015, the PLOs of the ASNS Program at Leeward were narrowed down from 6 to 4. The current PLOs are listed below.

PLO #1. Analyze data effectively using current technology.
PLO #2. Communicate scientific ideas and principles clearly and effectively.
PLO #3. Analyze and apply fundamental mathematical, physical, and chemical concepts and techniques to scientific issues.
PLO #4. Apply STEM concepts and techniques in one’s chosen field of study, such as biology, chemistry, engineering, computer science, etc.

In this academic year, the ASNS Coordinator had identified core courses in the ASNS program for PLOs assessment. With the guidance from Jayne Bopp of the Office of Planning, Policy, and Assessment (OPPA), two of the core courses were selected since every ASNS majors is required to take them before they go into one of the four tracks. The selected core courses were CHEM 162 and CHEM 162L (i.e. General Chemistry II and General Chemistry II Lab, respectively).

Next, the SLOs of CHEM 162 and CHEM 162L were mapped to the PLOs of the ASNS program (see Table 1 below). With the help of OPPA, I listed the assessment data of these SLOs from each course according to the specific PLOs. For example, the SLOs #1, #2 and #5 of CHEM 162 and the SLO #5 of CHEM 162L were mapped to the same PLO #1 where students are required to “analyze data effectively using current technology”. Each PLO was calculated by taking the average of all the SLOs data.

Table 1. The PLOs Assessment Result of the ASNS Program in 2019/2020.

<table>
<thead>
<tr>
<th>Mapping SLO to PLO</th>
<th>PSLO #1: Analyze data effectively using current technology.</th>
<th>PSLO #2: Communicate scientific ideas and principles clearly and effectively.</th>
<th>PSLO #3: Analyze and apply fundamental mathematical, physical, and chemical concepts and techniques to scientific issues.</th>
<th>PSLO #4: Apply STEM concepts and techniques in one’s chosen field of study, such as biology, chemistry, engineering, computer science, etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 162’s SLO*</td>
<td>SLO #1 (75%) SLO #2 (75%) SLO #5 (81%)</td>
<td>SLO #7 (81%)</td>
<td>SLO #3 (72%) SLO #6 (81%)</td>
<td>SLO #4 (72%)</td>
</tr>
<tr>
<td>CHEM 162L’s SLO**</td>
<td>SLO #5 (85%) SLO #6 (85%)</td>
<td>SLO #2 (85%) SLO #4 (85%)</td>
<td>SLO #3 (85%)</td>
<td></td>
</tr>
<tr>
<td>Overall PSLOs</td>
<td>79%</td>
<td>83%</td>
<td>80.8%</td>
<td>78.5%</td>
</tr>
</tbody>
</table>
Based on the assessment results, each of the PLOs was fulfilled.
- PSLO #1: 79% of the students in CHEM 162 and CHEM 162L fulfilled the program student learning outcome of “analyze data effectively using current technology”.
- PSLO #2: 83% of students in the core courses fulfilled the program student learning outcome of “communicate scientific ideas and principles clearly and effectively”.
- PSLO #3: 80.8% of students in the core courses fulfilled the program student learning outcome of “analyze and apply fundamental mathematical, physical, and chemical concepts and techniques to scientific issues”.
- PSLO #4: 78.5% of students in the core courses fulfilled the program student learning outcome of “apply STEM concepts and techniques in one’s chosen field of study, such as biology, chemistry, engineering, computer science, etc”.

This overall data indicated that more than 70% of the students in CHEM 162 and CHEM 162L fulfilled each of the Program Learning Outcomes. Although this is a positive sign that we are on the right track, we will need to assess other core courses of the ASNS Program for a meaningful assessment in the future.

Part IV.B. Curriculum Revision and Review (For Instructional Programs)

The ASNS Coordinator submitted changes to the program curriculum during fall of 2019 and fall of 2020. In 2019, curricular changes that would broaden the electives and streamline the pathway for students obtaining the ASNS degree were submitted. The changes include: a) updating GG to ERTH, b) accepting ICS 111 for EE 160 (i.e. specifically for CE and ME students), c) updating foreign languages requirement from 2 to 4 semesters, and d) changing FS to FQ for Math 241. In 2020, we only submitted the change to update the HORT 110/110L to AG 110/110L as they are being renamed.

Part V. Survey Results

The ASNS Coordinator will construct a Program Evaluation Survey in early spring of 2021. The survey will include questions related to students’ learning experiences, barriers, needs and suggestions. This survey will be administered to the ASNS students in April of 2021.

Part VI. Overview Analysis of Program

- Alignment with mission
  - The ASNS Program mission is to help our students follow a clear pathway to achieve their academic goals in STEM education. Our previous and current action plans were all designed with the focus to help create a smoother pathway. In addition, our program mission matches well with Leeward CC’s Vision where we are a learning-centered institution committed to student achievement. Our faculty and staff strive to provide a
high-quality education and a valuable learning experience to each of our student every step of the way.

- Evidence of quality
  - Although the overall number of student enrollment at Leeward CC has been declining since 2015, the ASNS program has seen a steady demand of having about 390 ASNS majors for the past five years. The quality of the ASNS program is also reflected by an increase of 47% of the number of ASNS courses being taught at Leeward.

- Evidence of student learning or meeting student, faculty/staff or campus needs
  - All four PLOs were assessed for the first time in 2019/2020 and the assessment result provided the evidence that our students were fulfilling each program learning outcome. We have selected CHEM 162 and CHEM 162L as the core courses since all ASNS students were required to take these classes before going into their own concentrations. The assessment of the PLOs is meaningful and future assessment will be conducted on other core courses of the ASNS program.

- Resource sufficiency
  - When compared to other ASNS Programs across the system, we are very fortunate to have our ASNS Counselor, Heather Takamatsu. Heather has played a vital role since the start of the ASNS program by helping ASNS students work their way through the pathway. Since the onset of the pandemic, the college will experience a shortage in budgets for the next few years and this will affect the programs at Leeward. We hope that the college will continue to support the hiring of Leeward students who will offer tutoring sessions online through video conferencing tools.

- Summary of key findings and conclusions
  - The ASNS program has remained consistent in the demand indicators for the past five years. In fact, the overall data indicate that we have more majors and non-majors students who are taking a full load of ASNS courses with a steady persistence in their studies since 2015. In addition, we are seeing an increasing number of ASNS students who transferred to the UH system since 2016. These are strong evidence which supports and reflects the demand and efficiency of the ASNS Program at Leeward CC.
  - On the other hand, we did see students struggling in distance education classes and a large number of withdrawals since 2016. This indicated there were barriers which affected the students in finishing their classes. This would also affect the number of students who received their degrees.

- Recommendations for improving outcomes
  - The ASNS Coordinator plan to work with OPPA, the Halau, as well as the Math and Science Division in identifying the barriers that are affecting our students in finishing their classes.

**Part VII. Action Plan**

During the process of mapping SLOs to PSLOs, I found out that the current PSLOs are very specific. This makes it quite difficult to assess other core courses of the ASNS program. For example, MATH 241 is a core course where all ASNS majors are required to take. However, MATH 241 does not fulfill PSLO #3 as it doesn't cover physical and chemical consents and techniques. To present a meaningful
assessment which will cover other core courses in the future, my action plan will include the following steps.

**Action Plans:**

1. **Refine PLOs:**
   The ASNS Coordinator will refine the PLOS with the recommendations from the Division of Math and Sciences in spring of 2021. The ASNS Coordinator will do so by working with our Division Chair, Discipline Coordinators, and our faculty in the Math and Sciences Division.

2. **Mapping SLOs to PLOs for other core courses:**
   The ASNS Coordinator will continue to work with OPPA on refining the mapping of SLOs to PLOs in Spring 2021.

3. **Submit Program Changes:**
   The ASNS Coordinator will submit the changes of the PSLOs to the Curriculum Committee during fall of 2021.

4. **Assessment of the ASNS courses:**
   The ASNS Coordinator will help the Division Chair and the Math and Sciences Assessment Committee in getting our courses assessed, especially for the core courses that are listed in the 4 tracks of the ASNS Program.

5. **Collaborating with OPPA:**
   i. Data Analysis for declining fill rates (#9 of the ARPD data) and its relation to overall enrollment at Leeward.
   ii. Data Analysis for course withdrawal: In #17 of the ARPD data, there is a sharp increase of withdrawals (from 147 to 226) in 2019/2020. It would be vital to identify these courses with the number of withdrawals.
   iii. Data Analysis for transfer students: We see a trend of students who transfer without their ASNS degrees (#20b of the ARPD data). It would be of interest to identify the specific concentrations of the students and to encourage them to transfer with the degree.
   iv. Data Analysis for successful completion rate in DE course: We saw a decreasing trend of students’ successful completion in #24 of the ARPD data in the past three years. I want to identify these DE courses in order to help students have a better learning experience.

6. **Collaborating with Hālau ‘Ike o Pu‘uloa:**
   The ASNS Coordinator and the ASNS Counselor will work with the faculty and counselor of Hālau ‘Ike o Pu‘uloa to find out what caused the declining number of Hawaiian students in the ASNS program (#1a of the ARPD data). Once we narrow down the factors, we can look for ways to improve this situation.

7. **STEM Undergraduate Research Group Experience (Long-term goal)**
   Our Math and Sciences Faculty are already conducting research with students at Leeward CC. These research projects and programs were funded by grants. The potential of the grant running out is highly possible. The ASNS Coordinator will seek advices from the other ASNS programs that have successfully institutionalized their Undergraduate Research Program.

8. **Increasing student enrollment (Long-term goal)**
   This will be a continuous effort for the ASNS Coordinator and the ASNS Counselor to reach out to new students through orientations and workshops. We will also have our faculty spread the words about the ASNS program at Leeward.
Part VII. Resource and Budget Implications

I am NOT requesting additional resources for my program.