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Information Fluency Instruction as a Continuous Improvement Activity

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Information Literacy Instruction as a Continuous Improvement Activity

Abstract

Assessment and continuous improvement activities required for accrediting bodies are often wholly carried out by the department responsible for the program. Alternatively, these processes present opportunities to collaborate with colleagues across the campus whose expertise may align with the program's student learning outcomes. This paper discusses the California State University Maritime Academy Mechanical Engineering program's collaboration with the Library department in the assessment and continuous improvement of ABET Engineering Accreditation Commission (EAC) Student Outcome 7 ("an ability to acquire and apply new knowledge as needed, using appropriate learning strategies."). Indicators of this outcome were found to align closely with an institution-wide learning outcome called information fluency, where students will demonstrate an ability to "define a specific need for information; then locate, evaluate, and apply the needed information efficiently and ethically." This institution-wide outcome would be used as an indicator of performance in ABET EAC Student Outcome 7.

In the 2016-17 academic year, an institution-wide assessment found the assessment scored for students in the Mechanical Engineering program were below the benchmark for information fluency. In response, the Mechanical Engineering faculty collaborated with the campus engineering librarian to develop instruction in information literacy in the appropriate courses within the curriculum. Information literacy modules were developed and implemented in eight courses throughout the curriculum. This instruction ranged from stand-alone assignments in freshman courses to multi-semester scaffolded assignments and research consultations in the senior capstone course sequence.

Following the implementation, assessments were conducted to track the curriculum changes' effects, which closed the loop on the continuous improvement process. The results from information fluency assessments in Academic Year 2018-19 and the preliminary findings from the 2020-21 academic year showed improvement in the Mechanical Engineering students' assessment scores. In addition, this collaborative effort in assessment, curriculum development, and implementation was presented under Criterion 4 in the program's self-study report in 2019. The processes presented may help engineering programs attempting to address improvement in this ABET student outcome and motivate interest in increased collaboration with their engineering library to strengthen instruction in information literacy.

Introduction

The ABET Engineering Accreditation Commission (EAC) transitioned to a new set of student outcomes defined in Criterion 3 in the 2019-2020 academic year, culminating a decade of review, assessment, and constituent consultation [1], [2]. However, the new outcomes did not represent a full departure from the former outcomes. ABET provided a mapping between the old and new student outcomes in its accreditation updates [3]. Student Outcome 7 (an ability to acquire and apply new knowledge as needed, using appropriate learning strategies) aligned

closely with the old Student Outcome i (a recognition of the need for, and an ability to engage in life-long learning). The new outcome remains focused on the ability to learn after graduation but places more emphasis on knowledge acquisition and application. However, the persistence of this concept in the student outcomes belied its importance to EAC's constituent engineering societies. The work in this paper spanned the student outcome change but will reference Student Outcome 7, even though prior to 2019, it was Student Outcome i.

Assessment of Student Outcome 7 could be done using a variety of performance indicators or measures. If interpreting the outcome's focus as lifelong learning, performance indicators could be derived from the AACU Foundations and Skills for Lifelong Learning VALUE rubric, which measures students' curiosity, initiative, independence, transfer, and reflection [4]. However, engineering programs could interpret Student Outcome 7 as relating to the acquisition of knowledge within the engineering profession. For example, a performance indicator could be to measure students' ability to research and acquire engineering standards. In addition, this performance indicator would support the requirement for the implementation of engineering standards as a part of the curriculum's design experience. Estes et al. [5] approached this outcome as the demonstration of knowledge acquisition without assistance. "Examples might include a new software program, a technical concept in an engineering class, or the use of a piece of equipment for an experimental purpose [5]."

Another approach was to assess students' skills in finding credible information using a variety of tools. These skills have grown in importance with the vast and growing array of information sources available to the engineering community today. This approach aligned with the broader skillset of information literacy, also referred to as information fluency at California State University Maritime Academy (Cal Maritime). Doing so allowed a program to leverage the campus's engineering librarian's professional expertise, which was otherwise not available from the program's faculty.

Information literacy instruction for engineers is unique compared to other disciplines. Since the late 1960s, researchers have been investigating how engineers use information. Gertsberger and Allen [6] found that engineers follow the "law of least efforts." They select information sources that minimize effort. This effort is characterized by accessibility. Information channels are perceived as being more accessible if the engineer is familiar with them [6]. Engineers are also motivated to use information to solve specific problems rather than general knowledge, as might be the case in other disciplines [7]. One of the reasons is that the outcome of work by engineers is a service or product, while the outcome of work by scholars is instead knowledge [8].

Information literacy instruction in higher education traditionally has occurred in one-time, independent class sessions or workshops. These sessions' effectiveness has been questioned due to the lack of depth and integration with learning outcomes in the course or curriculum [9]. Librarians have been working with new models of information literacy instruction like embedded librarianship [10]. In this spirit, the collaboration of engineering librarians and engineering faculty has been key to resolving this issue by integrating information literacy instruction into courses and throughout program curricula [11]. For example, Riley and Piccinino [12] collaborated with engineering faculty to integrate information literacy topics into multiple assignments throughout a course in Mass and Energy Balances. Nelson and Fosmire [13] worked

with the engineering technology faculty to examine information literacy standards in a non-technical course in their curriculum.

Assessment of efforts to integrate information literacy instruction has been challenging. MacAlpine and Uddin [14] integrated information literacy instruction into all four years of an Engineering Science program but noted that assessment still needed to be more formal and systemized. Nerz and Ballard [15] collected favorable assessment data from one of the assignments introduced after collaborating with the Chemical and Biomolecular Engineering department to create scaffolded information literacy assignments over four courses. Developing effective assessment tools, processes, data, and benchmarks are critical to developing meaningful curriculum changes. In addition, those items help in getting support from program faculty that may not be aware of information literacy or the resources available on campus in that field of study. For example, when Nelson and Fosmire [13] presented their collaboration with the engineering library faculty in Electrical and Computer Engineering Technology's curriculum revision. The program reached out to the engineering librarians for their expertise during the program's learning objectives revision, especially in proposing changes to improve lifelong learning and information literacy instruction. However, the paper does not indicate that the changes related to this area were assessment-driven. Being brought in for the curriculum development conversation without the use of assessment data made it challenging to promote the information literacy changes amongst the many others in the program. As a result, the changes were not necessarily implemented in the final curriculum.

Assessment Infrastructure

This paper presents the assessment and continuous improvement efforts in information literacy that resulted from a collaboration at Cal Maritime between the Mechanical Engineering department and the library. These efforts aimed to improve student learning in the area of Student Outcome 7. The Cal Maritime Mechanical Engineering is the only program on the campus accredited by EAC; the School of Engineering's Facilities Engineering Technology and Marine Engineering Technology programs are accredited by the Engineering Technology Accreditation Commission.

Prior to the changes discussed in this paper, the Mechanical Engineering program conducted its assessments entirely internally. Rather than using performance indicators, course learning outcomes were directly mapped to the student outcomes. A mapping was created for all of the courses taught by the program. Courses were selected for biannual assessment to ensure a representative picture of the small population of Mechanical Engineering students in all of the student outcomes. Instructors measured students' achievement of the course learning outcomes through assessment of student work samples. The scores were then aggregated on the program level for review followed by development of improvement activities. Generally, instructors taught the same courses year after year resulting in relative consistency in assessment practices within these course outcomes over time. However, there were no program-wide benchmarking processes. While the expertise of the program's faculty aligned with many of the learning outcomes, for other student outcomes, such as the ability to acquire and apply new knowledge, the program would benefit from bringing in expertise in this area from outside the program.

The Institution-Wide Assessment Council (IWAC) is responsible for the assessment of institution-wide academic student learning outcomes. The charge of the council is to "implement the Assessment Plan according to a four-year calendar and process chart, notify the campus community of the Learning Objectives to be assessed prior to the commencement of the Academic Year, identify and notify appropriate faculty and instructors for assessment practices, collect and organize assessment data, and suggest actions to be taken on assessment findings." There were nine institution-wide learning outcomes. All students graduating from Cal Maritime should demonstrate mastery of these learning outcomes regardless of program.

The Information Fluency Institution-wide Learning Outcome (ILO) is "Define a specific need for information; then locate, evaluate, and apply the needed information efficiently and ethically." This process consists of a rubric-based assessment of student work samples from all programs at the university (see Appendix A for the rubric). In addition to the institution-wide assessment of information fluency, the Library department conducts its own assessment of information fluency instruction on an offsetting cycle from IWAC. In this assessment, librarians review the recommendations from previous IWAC findings and collected interim data to monitor the progress and effectiveness of implemented changes.

During the 2016-17 academic year, IWAC collected artifacts from seniors of all programs to assess this learning outcome. Mechanical Engineering students were assessed at the mastery level using their senior lab reports, capstone project final reports, and engineering ethics papers. The results of the rubric scoring showed the Mechanical Engineering seniors failed to meet the benchmark (70% or more students scoring satisfactory or higher) and performed below their peers in other majors. This assessment will be discussed in more detail in the section "Assessing the Curriculum Change." One of the differences identified between Mechanical Engineering students and other programs was the lack of required information literacy courses.

Curriculum Development

In 2015, a new librarian was assigned as the liaison to the School of Engineering. This liaison role is responsible for information literacy instruction for the programs within the School of Engineering. Early experiences working with two engineering courses coupled with the poor results for Mechanical Engineering students in the 2017 IWAC assessment of information fluency led the Engineering Librarian to seek ways to enhance the quality and consistency of information literacy instruction for Mechanical Engineering students.

The next task was to establish support from the Mechanical Engineering department and its faculty. The assessment data was useful in illustrating the need for curriculum changes with respect to Student Outcome 7, and the department began efforts to improve in the area. Initial coordination involved meetings between a representative for the Mechanical Engineering program and the library to review and drill deeper into the findings from the assessments. Both educators had familiarity with assessment, either on the program or campus level, making it easier to jump into working with the course outcomes and identify which courses should be examined and potential changes could be made. This process was helped by the fact the program itself was small, and faculty generally taught the same courses each academic year.

The Engineering Librarian created an Information Literacy Instruction Plan for the Mechanical Engineering program. The goals for the plan were to:

- **Improve the total number of Mechanical Engineering students reached** by targeting multiple courses throughout the curriculum. By identifying a standard set of courses staggered over the four-year academic curriculum, students were less likely to miss out on information literacy instruction when they transfer units from other schools, miss attendance on the day of information literacy instruction, or take a course by an instructor who does not include library instruction in their class.
- **Increase the scope of information literacy instruction** through scaffolded learning outcomes. Ad hoc library instruction often targets the most relevant learning outcomes for the current assignment rather than learning outcomes that have been built off of previous instruction. Creating a common set of learning outcomes that scaffold the mastery of information competencies throughout the curriculum provides students with a well-rounded foundation of information literacy skills.

The Engineering Librarian examined the Mechanical Engineering curriculum by reviewing course descriptions and syllabi and through discussions with course instructors. The *Information Competency Standards for Engineering* (created by the ASEE Engineering Libraries Division) [16] were then matched to individual courses in the curriculum. In addition, learning outcomes were developed for each course. Figure 1 provides an example from the freshman introduction to the major course.

ENG 110 Introduction to Engineering and Technology (Fall, 1 unit)

Library Instruction

- One class visit
    - Industry, company, professional organization research

Standards Addressed

- Standard 5.1 The information literate student recognizes the value of ongoing assimilation and preservation of knowledge in the field.
- Standard 6. The information-competent student identifies information sources needed to acquire information about established companies in a specific area and identifies sources of knowledge and skills for entrepreneurial endeavors.

Student Learning Outcomes

- The student recognizes that it is necessary for a professional to keep up with new developments published in the literature of the field.
- This competency is demonstrated by the ability to use business, trade, and patent search tools to gather competitive intelligence and understand engineering research and development in a broader strategic and societal context.

Figure 1. Example Information Literacy Learning Outcomes

This created a targeted information literacy instruction plan that scaffolded information literacy learning outcomes throughout the Mechanical Engineering curriculum. The proposed instruction plan addressed all six of the Information Competency Standards for Engineering created by the

Association of College & Research Libraries and the American Society for Engineering Education. In addition to General Education courses where information literacy instruction was provided, this instruction plan targeted seven additional courses in the Mechanical Engineering curriculum (Figure 2).

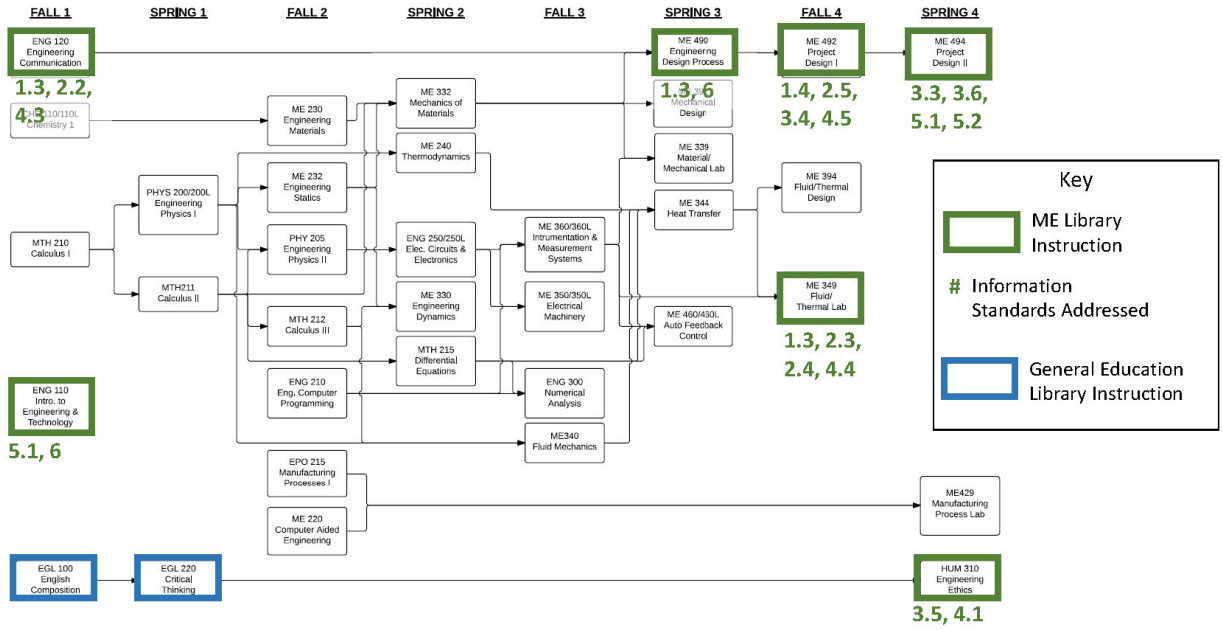

Figure 2. Curriculum Map proposed in Summer 2018

The plan was presented to both the library department and the Mechanical Engineering department in the summer of 2018 and received consensus and agreement from both departments to proceed with implementing the plan.

Implementation

The Engineering Librarian began coordinating with Mechanical Engineering faculty to provide information literacy instruction in each of the classes identified in the curriculum map in Fall 2018. The initial instruction focused on the proposed learning outcomes. The instruction in many courses evolved as formative assessment was gathered from student artifacts and Mechanical Engineering faculty feedback. The following is a summary of the information literacy instruction from Fall 2018 through Spring 2021.

Mechanical Engineering Capstone Project Sequence

A significant portion of the Mechanical Engineering information literacy instruction revisions occurred in the capstone project sequence. Before Fall 2018, the library liaison provided two stand-alone instruction sessions about patents, codes, and standards. A collaboration between the Engineering Librarian and the capstone course series instructor (new to the position) began in the Fall 2018 semester. The collaboration focused on improving the literature review of the final project reports. Formative assessment was used each semester to modify and improve the

capstone project's information literacy components. Below is a brief description of the instruction currently being provided in the capstone sequence.

- **ME 490 (Spring Junior Year).** During this semester, students formed project teams and began planning their projects. The Engineering Librarian's presence in this course was significant as students conducted their preliminary research to begin the design process. The information literacy instruction and assignments made up 50% of the students' final course grades. There was a scaffolded assignment sequence to guide students through the research process. Students began keeping an individual research log the first week of the semester and eventually created an annotated bibliography with their group. After completing the annotated bibliography, groups were required to attend a research consultation with the Engineering Librarian. At the consultation, groups reviewed the credibility and appropriateness of information sources they had already found as well as where to search for missing information. Finally, students compiled their efforts into a literature review at the end of the semester. The Engineering Librarian graded and provided feedback on all of these assignments. In addition, beginning in the spring of 2020, the Engineering Librarian began attending group presentations and providing feedback on the use of information sources in their presentations. Although student evaluations were not collected due to the COVID-19 pandemic in Spring 2020, seven responses were received from students in an anonymous survey distributed at the end of the semester. The results were positive and provided some areas for refinement in the next iteration, such as providing examples of past successful literature reviews.

- **ME 492 (Fall Senior Year).** During this semester, students revised and completed their detailed designs for their projects. The Engineering Librarian was still present in this course as students engage more deeply in the design process and had more specific information needs. The information literacy instruction resulted in 20% of the final course grade. There was another scaffolded assignment sequence to guide students through the research process. Students began by conducting an audit of their previously written literature review. The assignments required additional and more in-depth research and sources in this second semester. Groups again attended a research consultation with the Engineering Librarian to discuss their research strategies. Finally, students submitted a revised literature review assignment that incorporated new information sources and revisions that addressed previous feedback. The Engineering Librarian graded and provided feedback on all of these assignments. In addition, beginning in Fall 2020, the Engineering Librarian began attending group presentations and providing feedback on the use of information sources in their presentations.

- **ME 494 (Spring Senior Year).** In this final semester of the capstone project, students fabricated their final design. The Engineering Librarian's role in this semester was reduced as students were focusing on implementing their previous research. The Engineering Librarian visited the class at the beginning of the semester to remind them of availability, but the bulk of interactions were through individual research consultations and assistance in accessing information sources.

Other Information Literacy Instruction in the Mechanical Engineering Curriculum

The following are brief descriptions of additions or revisions to information literacy instruction in other courses identified in the Mechanical Engineering Information Literacy Instruction Plan.

- **EGL 120 and ENG 110 (Fall Freshman Year).** These two courses were the first point at which information literacy was introduced in the major. EGL 120 was a technical communication course offered to Mechanical Engineering students. ENG 110 was the introductory course for the Mechanical Engineering program. The Engineering Librarian collaborated with these two courses during Fall 2018. Despite changes in instructors for both of these courses, progress has been made in adding a lesson plan to each course. In EGL 120, students were introduced to the literature of their discipline, specifically standards. In ENG 110, students were introduced to business and industry research as they begin considering future careers.

- **HUM 310 (Spring Senior Year).** This was the engineering ethics course taken by all seniors in engineering programs. The information literacy lesson plan previously used for this course was based on introductory general education learning outcomes with the assumption that students may not have had previous information literacy instruction. With the scaffolding that the instruction plan implements, a new lesson plan was created, which built on previous learning outcomes and introduce advanced topics like censorship and freedom of speech in the context of engineering scenarios.

- **ME 339 (Spring Junior Year).** ME 339 was a Material/Mechanical Lab course in the junior year. This course was not initially included in the instruction plan. However, after presenting the plan to the Mechanical Engineering department, the instructor contacted the Engineering Librarian to inquire if information literacy could be incorporated into the course. The instructor and Engineering Librarian identified an early lab report where students could use reference materials to verify or check the values they recorded during their lab experiments. Since this lesson plan was supplemental to the learning outcomes identified in other courses, it is an opportunity to reinforce exposure to literature in the discipline.

- **ME 349 (Fall Senior Year).** ME 349 was the thermal/fluids laboratory course taken in the fall of senior year. Students wrote lab reports that included a full theory review, experimental setup, results, and discussion. The instructor and the Engineering Librarian reviewed lab reports from previous semesters and identified many problems related to information literacy. They found that students' information sources in the theory section were of very low quality and often lacked authority or credibility. They also found that students were inconsistent and sloppy when citing information. The Engineering Librarian and the instructor collaborated to revise the assignment and created two new lesson plans to help students search for information and practice citation. The details of the changes will be discussed in the next section.

Developing Instructional Techniques to Better Integrate Information Literacy

As a part of the instruction development, the Mechanical Engineering faculty and Engineering Librarian studied how to better integrate information literacy into the course assignments to where it was part of the course rather than a one-off module. One course where this proved initially challenging was ME 349. The instructor for this course and Engineering Librarian collaborated to explore different instructional methods in information literacy. The biggest challenge was that the course's experiments were aligned with what was taught in fluid mechanics, which meant they were pedagogical and academic. They had little application to the current engineering field and thus not conducive to having students carry out a literature search. As the information literacy instruction was being developed, the course instructor restructured the course to include an experiment that tested large vehicle drag reduction devices. This lab still allowed for an experiment that explored drag forces and force measurement in the wind tunnel. The devices used were adapted from research in the previous decade, meaning that students would need to carry out a literature search to complete the theory section of their lab report. The change was combined with two dedicated instruction modules focusing on reference search tools and usage of citations in lab reports with direct application to their upcoming assignments. The results of this instructional change were documented in an ASEE paper [17]. The class was divided into a test group, which received the aforementioned instruction in person, and a control group, which passively received this instruction as online documents. Comparing the assessment results showed improvements in the test group's literature search and citation usage, although a larger student population was needed to make a definitive conclusion.

The findings from the first implementation were reviewed, and the instructional materials were revised. Minor modifications were made to the instructional materials. During this review, it was determined that the scope of the material covered could be expanded in a way that might better reinforce citation usage. Extensive usage of images in the student presentations with a lack of attribution was observed. In response, the module above was expanded to include the search and appropriate attribution for the use of images in presentations. Students were taught about usage rights (i.e., public domain and Creative Commons), search methodologies for images, and appropriate attribution. These changes were implemented during the 2018-19 academic year. Presentations before and after the instruction were assessed to quantify the changes in performance [18]. The findings showed some improvement in the appropriate use of citations and increased usage of non-copyrighted images, which served as a proxy measure of improved search techniques. The data show improvement when comparing the test group compared to the control group.

Assessing the Curriculum Change

In the 2017 IWAC report on Information Fluency, both the Mechanical Engineering and Business programs were identified as needing more or modified information literacy instruction. In 2019, the Library department collected artifacts from only the Mechanical Engineering and Business programs in freshman and senior courses and applied the same rubric (Appendix A) used by IWAC. The Mechanical Engineering program's results (Figure 3) showed improvement and confirmed the benefit of the information literacy instruction changes.

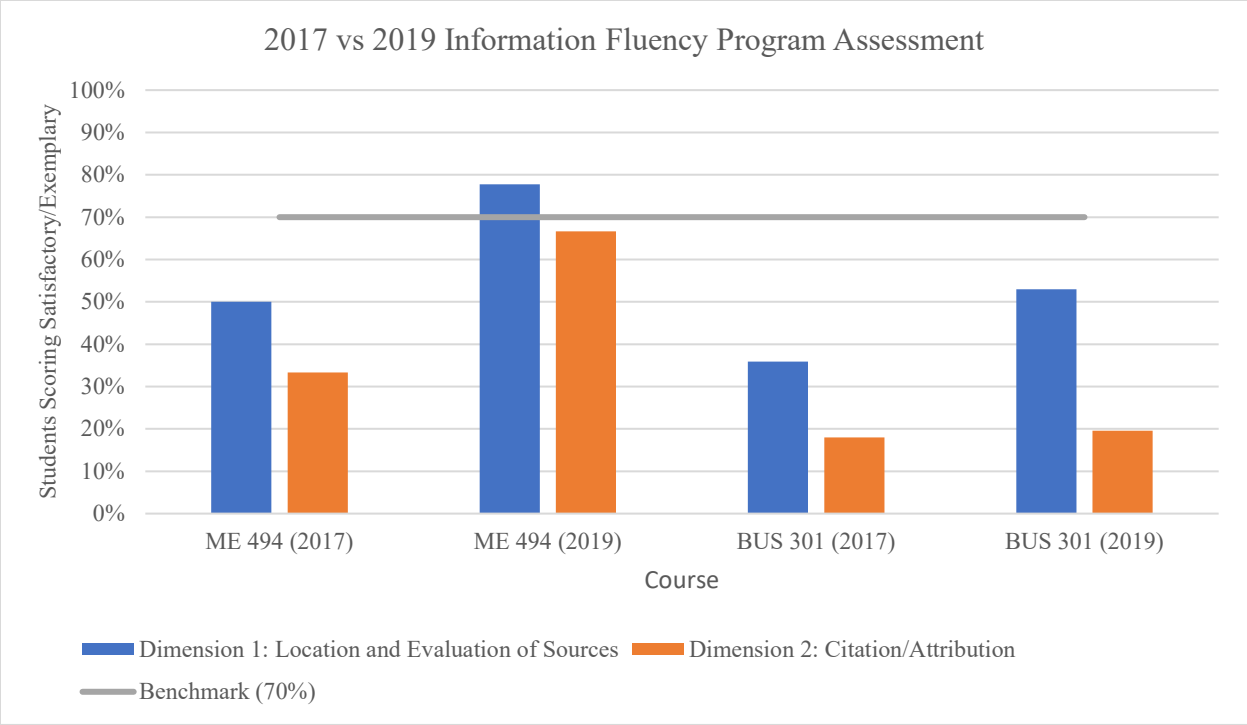

Figure 3. Comparison of 2017(IWAC) and 2019 (Program) Information Fluency Assessment

The Business Librarian had also completed a curriculum mapping exercise, but collaboration and implementation were challenging due to faculty turnover. The gains demonstrated by Business students in information fluency in this same period were noticeably less during this same period. This emphasizes the need for faculty buy-in and collaboration.

IWAC data collection and processing for information fluency is currently taking place for the 2020-21 academic year. These results are highly anticipated, as this will be the first cohort that has participated in the full suite of the revised information literacy instruction. Samples of student work were collected from the senior capstone and senior laboratory courses. The ME 349 individual student work assessments have been completed and will be included in the 2021 IWAC Information Fluency report. Compared to the 2017 report, these preliminary results show improvement in the dimensions assessed for information fluency (Figure 4). For location and evaluation of sources, the percentage of students scoring satisfactory or above improved from 55% in 2017 to 68% in 2021. For citation and attribution, the percentage of students scoring satisfactory or above improved from 48% in 2017 to 73% in 2021. The latter score meets the benchmark set by IWAC, which is 70% or more of students scoring satisfactory or higher. The full data set, which includes assessments from the senior capstone project and engineering ethics papers, will be analyzed in Summer 2021 by IWAC, and recommendations will be made based on those results. In parallel, the mechanical engineering program will use this data in addition to data collected from other courses in the program. However, when examining the results, it must also be considered that the campus has not been running regular in-person courses since March 2020 due to COVID-19. This invariably added uncertainty to the data and findings.

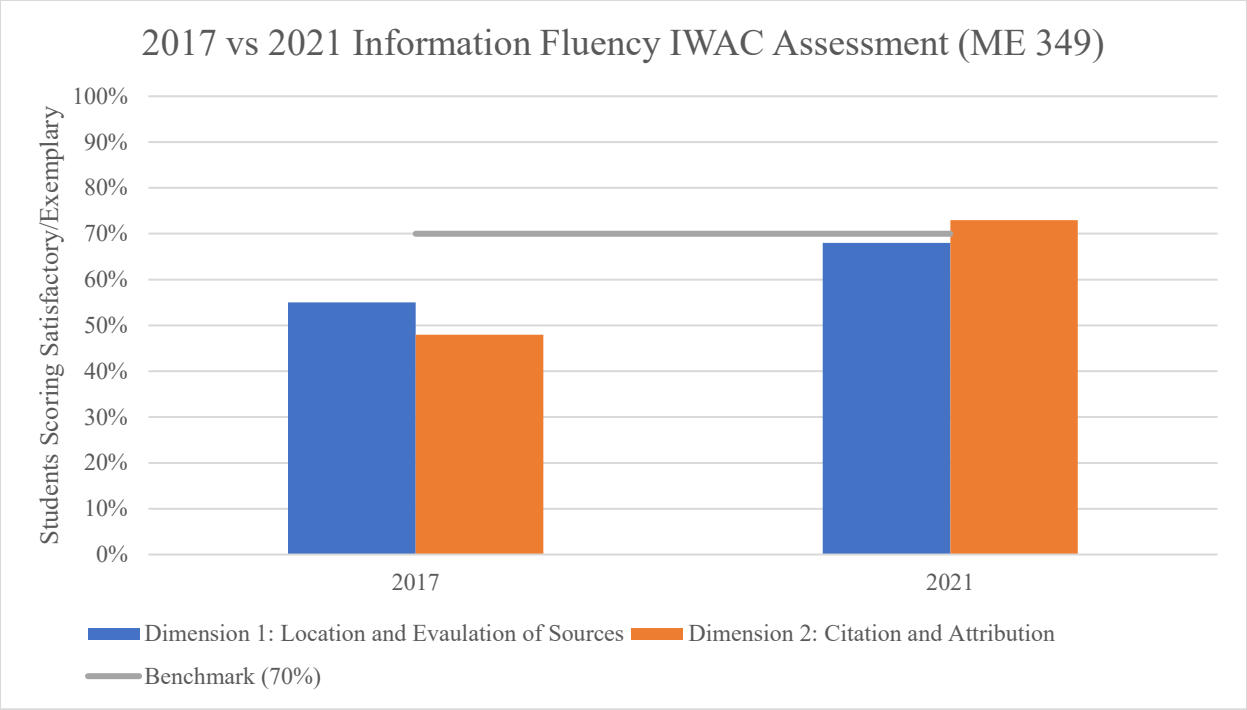

Figure 4. Comparison of 2017 and 2021 IWAC Information Fluency Assessment

The four-year cycle used by IWAC provides a structure to drive continuous improvement on a large scale. Still, many minor revisions have been made to information literacy instruction through the interim library program review and formative assessment at the course level. During the library program review, librarians discussed the artifacts used for information fluency assessment. The artifact used in 2017 and 2019 was the final capstone project report submitted by Mechanical Engineering students in their final semester of the program. While the 2019 assessment showed significant improvements, it was noted that one group neglected to include the literature review in their final report (it had been previously submitted but left off of the final report). This dramatically reduced the overall score and called attention to the need to assess student learning at an individual level. This has emphasized the importance of individual assignments that require information literacy components in other courses to complement the instruction occurring in the capstone course.

Formative assessment has also played a role in fine-tuning information literacy instruction in the Mechanical Engineering program. By working more closely with the students in the capstone project sequence and seeing their challenges in finding information sources, the Engineering Librarian has shifted more of the collection development budget allocated to engineering monographs and standards to topics directly related to student projects. Observations and collaboration between the librarian and capstone coordinator also identified a lack of high-quality information sources in student presentations. This has led to additional instruction for including information sources in presentations.

Student feedback collected in the first semester of the capstone sequence has also led to changes in the information literacy instruction provided. Students consistently requested more examples of literature reviews and information use in presentations. Reviewing previous student projects from institutional repositories, both at Cal Maritime and competing universities, has become part of the literature review assignment requirements.

This multi-year collaboration was the leading demonstration of continuous improvement for the Mechanical Engineering program's 2019 ABET accreditation visit. The assessment and curriculum changes documented in this paper were included in the ABET self-study report. The reviewers concurred that this work demonstrated the program's compliance with Criterion 4. Out of this process, the program has improved students' learning in Student Outcome 7 and in information fluency overall. The program has adopted the rubric used by the library and IWAC, measuring location and evaluation of sources and the use of citations. These now represent the primary performance indicators used in the assessment of Student Outcome 7. In addition, this alignment and cooperation between the program, IWAC, and the library will streamline future assessment operations and encourage further collaboration between the different assessment communities on campus.

Conclusion

The work presented in this paper documented one institution's approach toward assessment and continuous improvement as it relates to ABET EAC Student Outcome 7. The assessment-driven changes developed through the collaboration between the Mechanical Engineering program and Engineering Librarian improved student achievement, as evidenced by the most recent assessment data. The program will utilize this new data to develop further modifications in the curriculum to help meet the goal of attainment in both benchmarks in future assessments. This success would not have been possible without the collaboration between the program and the library and would encourage others with program indicators for Student Outcome 7 related to information literacy to utilize their expertise in assessment and program development.

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Appendix A: Information Fluency Rubric

This rubric is designed to assess student work such as papers, reports, presentations, and other projects for the following CSU Maritime Institution-Wide SLO:

Define a specific need for information; then locate, evaluate, and apply the needed information efficiently and ethically.

	N/A Not Applicable	**1 Initial 2**	**3 Emerging**	**4 Satisfactory**	**5 Exemplary 6**
Location and Evaluation of Sources	Assignment not applicable • Assignment instructions did not require sources	Sources do not contribute to assignment. • No exploration of outside sources or only non-authoritative or tertiary sources • Very limited awareness of universe of evidence which could strengthen argument	Sources lack variety/depth • Over relies on one source or type of source • Uses some non-authoritative or outdated sources	Sources are authoritative • Explores outside sources but missing some important sources • Overall source selection may be one-sided	Sources demonstrate thorough, sophisticated research and evaluation • Uses variety of authoritative sources • Kind and type of source match the goal of the argument • Provides reasoned rationale for use of sources
Citation/Attribution	Assignment not applicable • Assignment instructions did not require citation of sources	Use of evidence and citation so poor it is impossible to identify or evaluate sources. • Little or no attribution or citation • Fundamental errors in in-text citation or bibliography	Attribution present but incomplete and incorrect. • Citations frequently missing or incorrect • May cite common knowledge • Sources may be mischaracterized (poor summary/paraphrase) • May overuse quotes	Attribution present and complete but with some errors or inconsistencies	Sources cited consistently and correctly • Bibliography (if required) formatted according to consistent style • Paraphrases, summarizes, and quotes appropriately