# Civil Engineering
# ABET Evaluation Summary
# 2019-2020

This document describes the evaluation of ABET Program Educational Objectives (PEOs) and Student Outcomes for the Civil Engineering undergraduate program for 2019-20. Data were collected throughout the year and evaluated by the CEE Assessment Committee (Drs. Dupont, McNeill, Rice, and Ball) in June 2020. Note that previous members of the Assessment Committee, Drs. Barr and Tullis, were excused this year due to their appointments in Administrative Positions elsewhere at USU (Provost's Office and Office of Research, respectively).

## Program Educational Objectives

The Civil Engineering (CE) Program Educational Objectives (PEOs) are reviewed by each of the program's three constituencies (Table 1).

Table 1: PEO Review Process and Schedule for CE Program Constituency

| Constituency | Review opportunity | Frequency | Most recent reviews | Date of next review |
|---|---|---|---|---|
| Students | Freshman Orient. (CEE 1880) | Every freshman class (Fall and Spring) | Spring semester 2020 | Fall semester 2020 |
| | Junior design course (CEE 3880) | Every junior class (Spring) | Spring 2020 | Spring 2021 |
| | Senior exit interview | Every graduating class (Spring) | April 2020 | April 2021 |
| Employers | Advisory Board meeting | Annually (typically late Fall) | October 2019 | November 2020 |
| Faculty | CEE Faculty Retreat | Annually (August) | August 2019 | August 2020 |

**Students**: The PEOs are introduced to the freshman class in CEE 1880 as part of a lecture on the accreditation and licensing processes (see the slides in Appendix A). PEOs are again shown to the juniors in CEE 3880. This reminds continuing students about the PEOs and allows transfer students (who sometimes do not take CEE 1880) to see the PEOs. Finally, as part of the senior exit interview process, graduating seniors are given an opportunity to review the PEOs in an effort to establish some big picture career goals. Student comments related to the PEOs (Appendix B) were very positive.

**CEE Advisory Board**: The CEE Advisory Board met on October 29, 2019 (see Appendix C for meeting minutes). The Advisory Board unanimously approved keeping the current PEOs. The PEOs will continue to be reviewed and discussed at all future annual Advisory Board Meetings.

**Program Faculty**: The PEOs are reviewed and discussed with the program faculty at the annual faculty retreat, which takes place every August just prior to the Fall semester. The faculty unanimously approved keeping the current PEOs during the 2019 faculty retreat (see Appendix D for meeting minutes). The PEOs will continue to be reviewed and discussed at all future annual faculty retreats.

**Student Outcomes**

Assessment of the Student Outcome attainment is conducted by the CEE Assessment Committee on a specified schedule with approximately half of the Student Outcomes assessed every year (Table 2). When deficiencies are identified, recommendations are made to fix specific problems and support continuous improvement. For example, Outcomes b and f were re-assessed in 2017 because the program did not meet the performance goals in 2015-16. During the 2018-2019 school year, we changed to the new ABET Outcomes 1-7 instead of a-k so Outcomes 5, 6, and 7 were evaluated.

Table 2: Evaluation Schedule for Student Outcomes

| Evaluation Date | School Year | Outcomes Evaluated |
|---|---|---|
| May 2015 | 2014-15 | a, b, c, d |
| May 2016 | 2015-16 | b, e, f, g |
| May 2017 | 2016-17 | b, f, h, i, j, k |
| May 2018 | 2017-18 | a, b, c, d |
| May 2019 | 2018-19 | 1, 2, 3, 4 |
| **May 2020** | **2019-20** | **5, 6, 7** |

The assessment process uses data from three sources: student coursework, FE Exam results, and senior exit interviews. The 2019-20 Assessment of Student Outcomes includes data from Fall 2019 and Spring 2020. Note that the spring 2020 semester was severely disrupted by the COVID-19 pandemic as all instruction pivoted online in March. Although student performance was affected, the assessment and evaluation process remained remarkably intact.

**Student Coursework**: Outcomes 5, 6, and 7 were reviewed in 2019-20 (Table 2). Assessment data are summarized in Table 3 and Figure 1; detailed evaluation of each outcome is presented in Appendix E. Student assignments are evaluated on a 0-1-2 scale, which corresponds to the student's performance not meeting, partially meeting, and meeting the Outcome Objective, respectively. The CE program has two goals for student performance:

- Goal 1: a minimum of 70% of the students will perform at a 2 level
- Goal 2: a minimum of 80% of the students will perform at the 1 or 2 level.

Note the "sample size" in Table 3 refers to the number of individual examples of student work that were assessed for each outcome, not the number of students.

Table 3: Aggregated Assessment Results for CE Classes, Fall 2018 and Spring 2019

| Outcome | Sample size | 2 | 1 | 0 | Sum of 1&2 ratings |
|---|---|---|---|---|---|
| 5 | 364 | 88% | 3% | 9% | 91% |
| 6 | 786 | 82% | 15% | 3% | 97% |
| 7 | 442 | 83% | 14% | 3% | 97% |

Both Goals 1 and 2 were met for all three Outcomes (Figure 1). However, several instructors of spring 2020 courses noted that teamwork (Outcome 5) was disrupted by the pivot to online teaching due to the COVID-19 pandemic, as indicated by the increase in 0 ratings (Table 5-1 in Appendix E) compared to previous years' assessment of teamwork in outcome d. We had also planned to use an updated rubric that specifically addresses each of the items listed in the outcome, but this plan was derailed by the pandemic. The rubric will be developed and used starting in the 2020-21 school year.

As discussed previously with outcome b, the CE program has intentionally added exercises that require students to develop (design) and conduct experiments as well as analyze data, and these continue to be successful. The new "use engineering judgment to draw conclusions" aspect of the outcome has also been embraced.

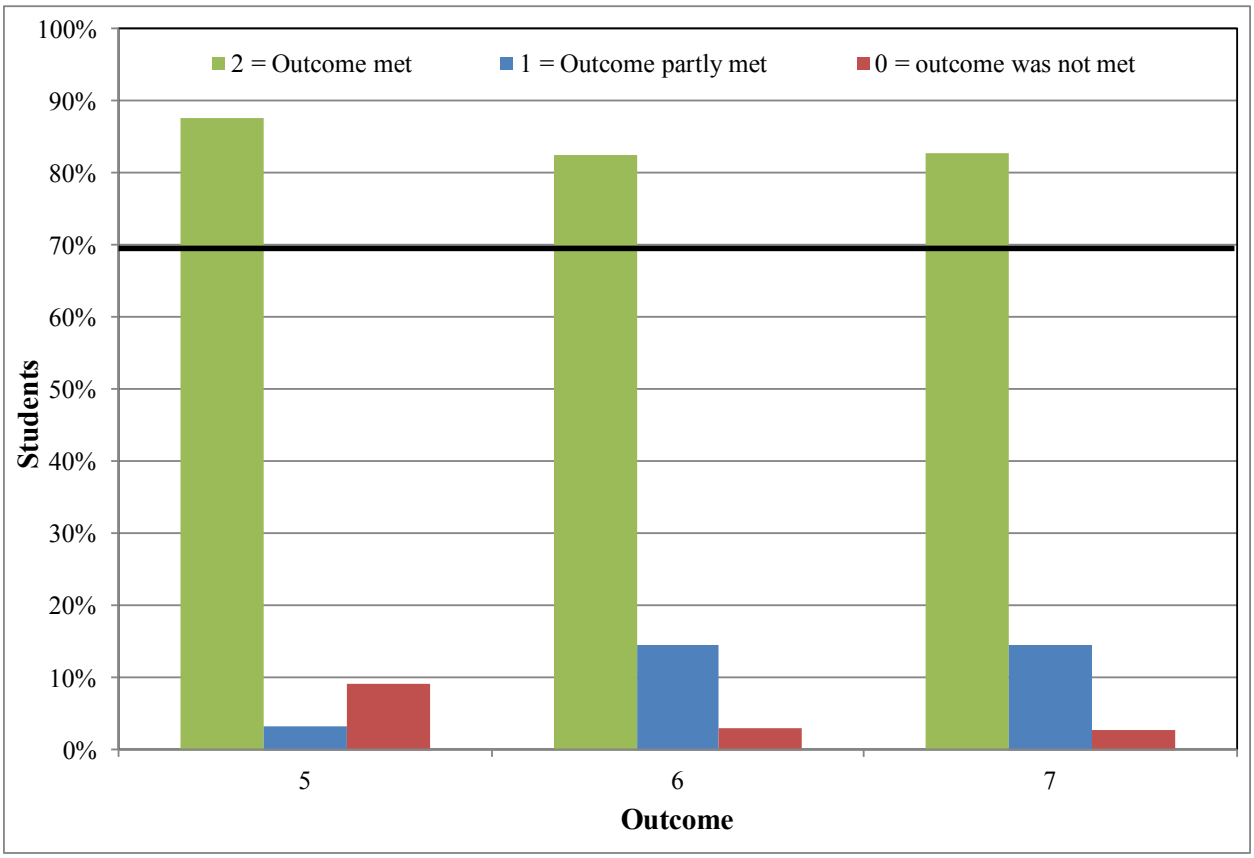


Figure 1: Aggregated Assessment Results for CE Classes for Fall 2019 and Spring 2020

**Fe Exam**: The CE program goal is to have a 100% pass rate for first-time test takers; the minimum acceptable level of performance is a pass rate at or above the national average, which has been achieved each of the past six years (Table 4). Note that starting with the student cohort entering the professional program in the 2014-15 academic year, all CE students have been required to pass the FE Exam prior to graduation, so by definition we now have a 100% pass rate for our graduates.

Table 4: CE Graduates Passing FE Exam vs. National Pass Rate

| | 2014-15 | 2015-16 | 2016-17 | 2017-18 | 2018-19 | 2019-20 |
|---|---|---|---|---|---|---|
| USU graduates | 59 | 53 | 68 | 72 | 57 | 71* |
| USU graduates passing FE (%) | 100% | 98% | 100% | 100% | 100% | 100% |
| USU first-time pass rate | 81% | 90% | 80% | 77% | 73% | 87% |
| National first-time pass rate | 70% | 69% | 68% | 69% | 69% | 70% |

*Preliminary estimate; 2019-20 graduation numbers will be finalized later this summer.

FE Exam performance by first-time test takers for various engineering topics is summarized in Figures 2 through 6. During the Fall 2019 and Spring 2020 testing period, students performed at or above the national average (considering the error bars) on all fundamental engineering topics except probability/statistics. Over the past six years, performance in that subject has often been statistically below the national average (Figure 2). We identified this trend several years ago and it's not surprising given that CE students do not take a standalone probability and statistics course. Starting in Fall 2018, we added one credit to the CEE 4200 course which will be used to provide a basic introduction to probability and statistics. We are also adding exercises into several CEE courses to provide some of this content, and hope to see improvement in FE Exam scores as more students experience this new curriculum.

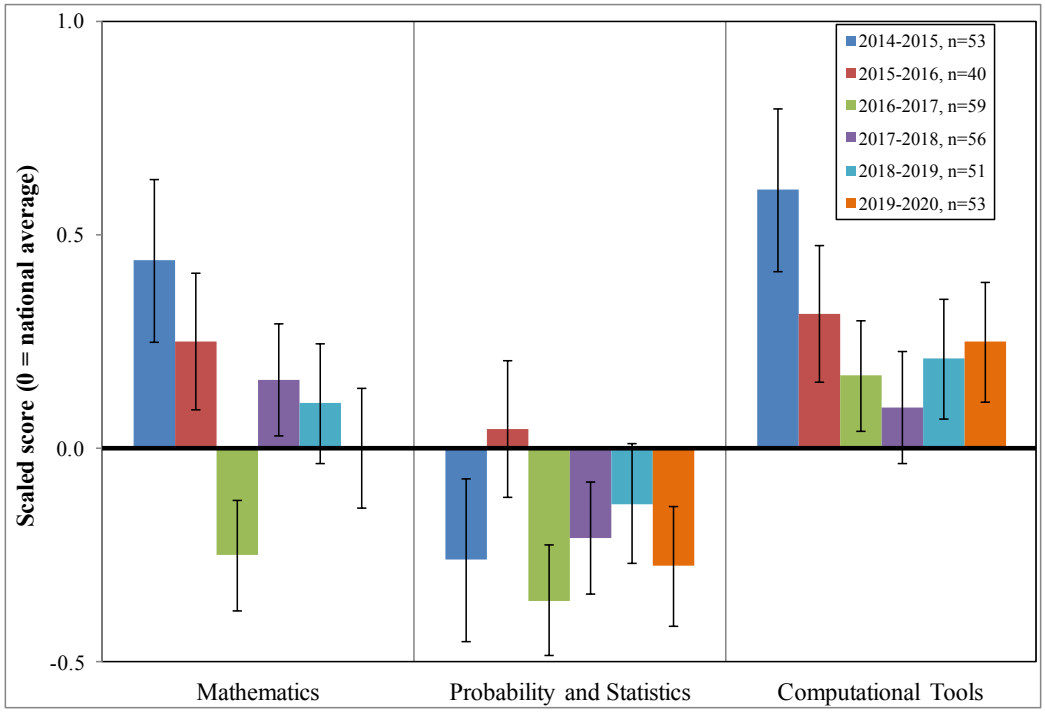



Figure 2: Scaled Fe Exam results (math, probability/statistics, and computational tools). Error bars represent uncertainty range for scaled scores.

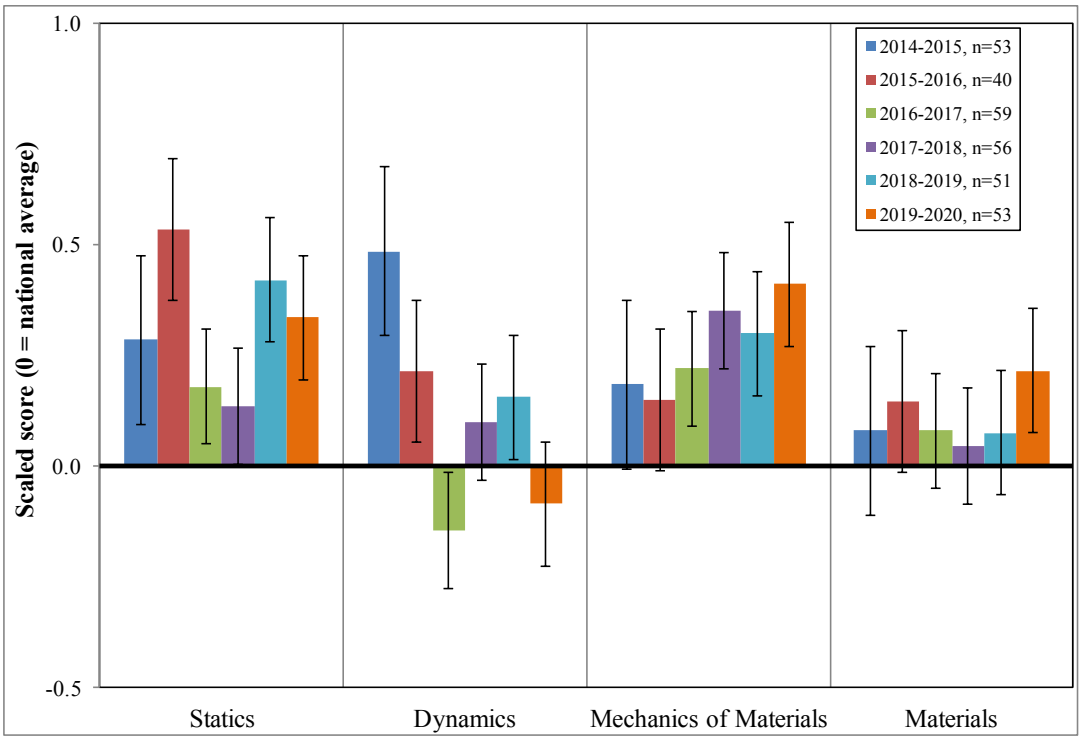



Figure 3: Scaled Fe Exam results (statics, dynamics, mechanics, and materials). Error bars represent uncertainty range for scaled scores.

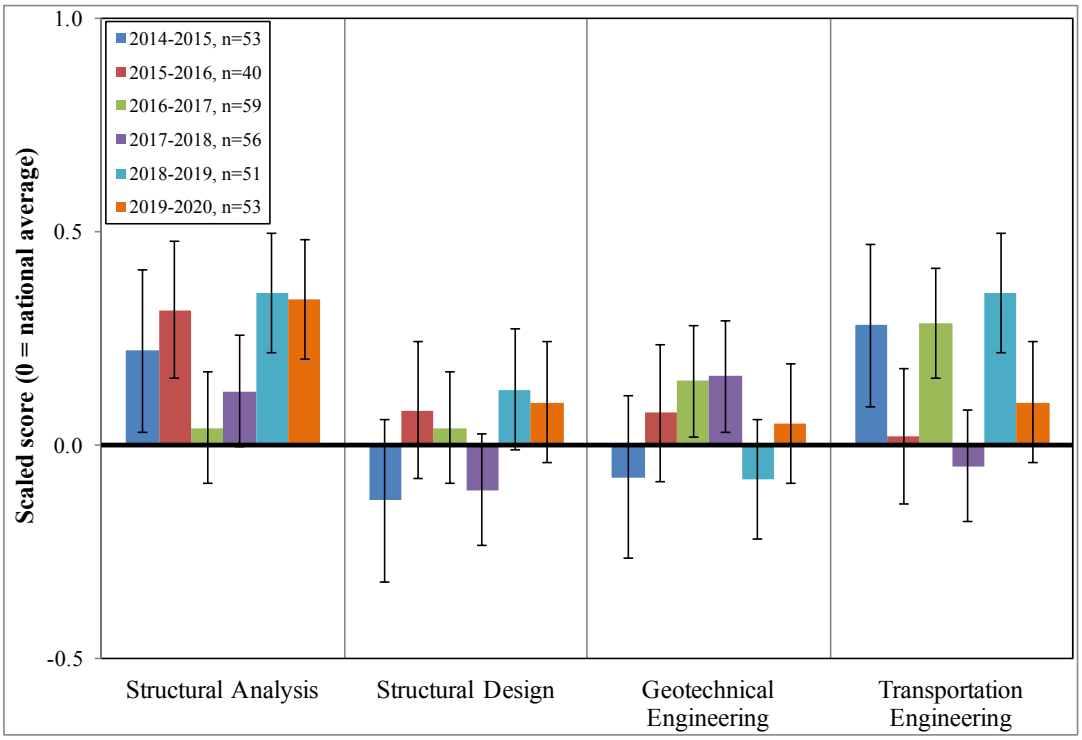



Figure 4: Scaled Fe Exam results (structural analysis and design, geotechnical engineering, transportation engineering). Error bars represent uncertainty range for scaled scores.

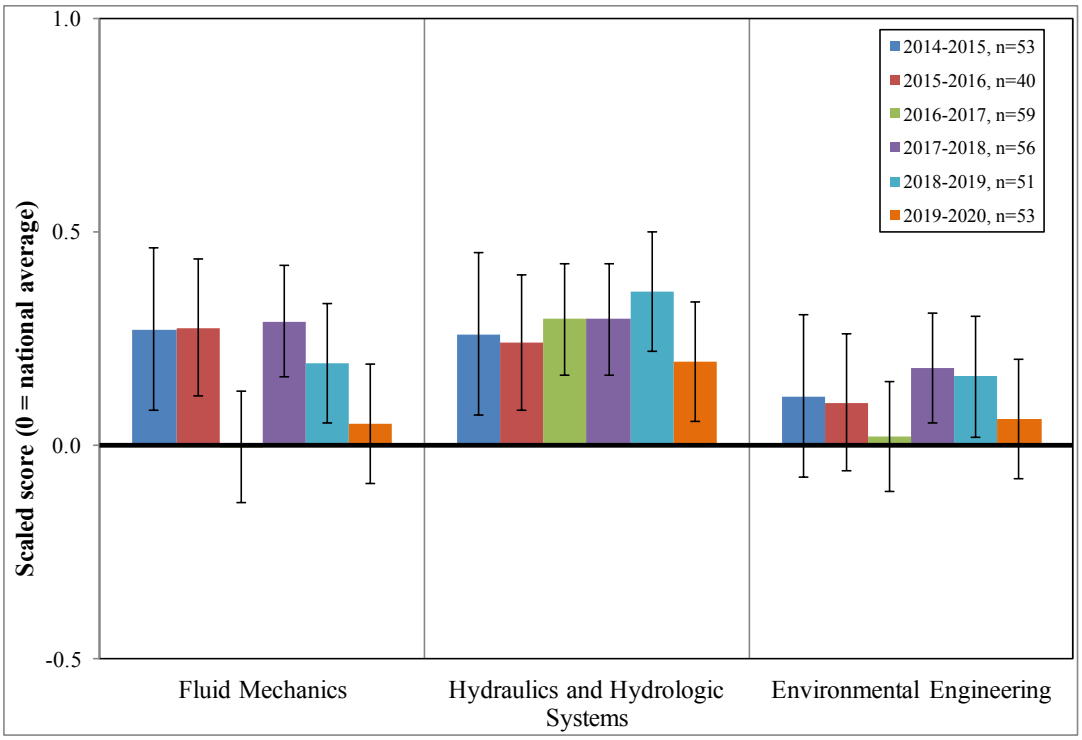



Figure 5: Scaled Fe Exam results (fluids, hydraulics, environmental engineering). Error bars represent uncertainty range for scaled scores.

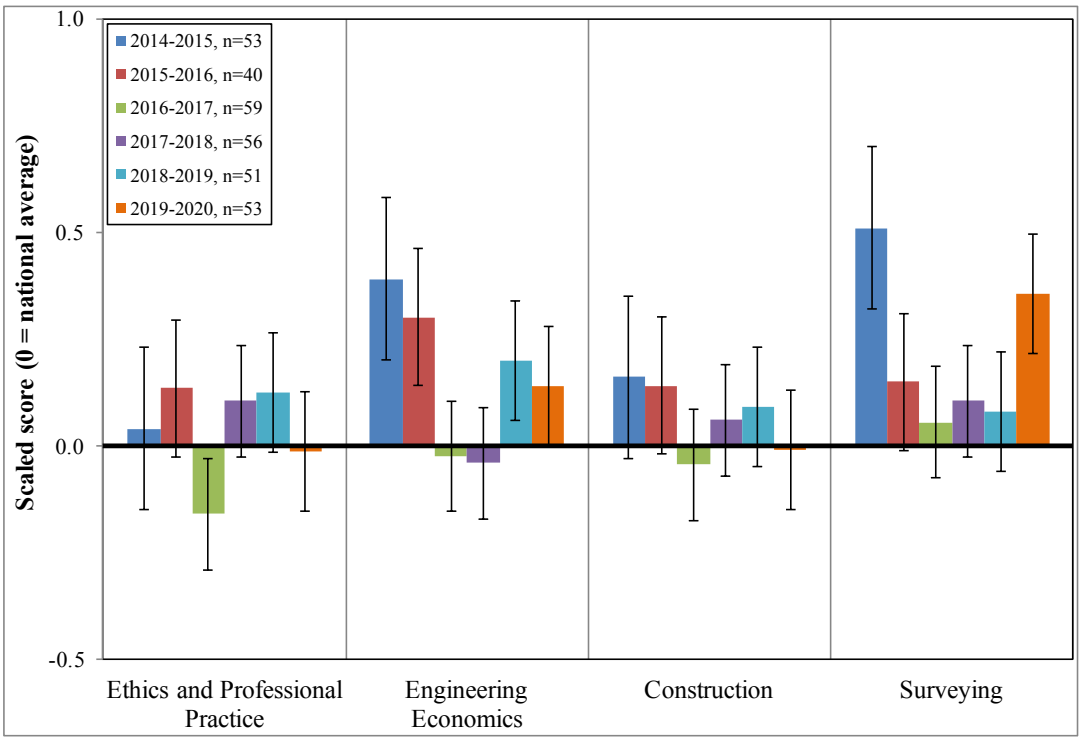



Figure 6: Scaled Fe Exam results (ethics and professional practice, economics, construction, surveying). Error bars represent uncertainty range for scaled scores.

**Senior exit interview**: Graduating seniors complete an anonymous online exit interview to provide feedback about the CE program and rate their perceived progress in meeting each of the outcomes. The performance goal is to have at least 80% of the students rating their attainment as "met (2)" or "partly met (1)", which was achieved for all three outcomes (Figure 7). In fact, no students reported failing to meet an outcome. The response rate for the survey was only 41% which is much lower than usual. This is very likely due to the COVID-19 conditions at the end of spring 2020 semester. Despite the lower response rate, and acknowledging that this is a subjective self-evaluation, these exit interview results are taken as a general indication that students feel they are meeting the outcomes.

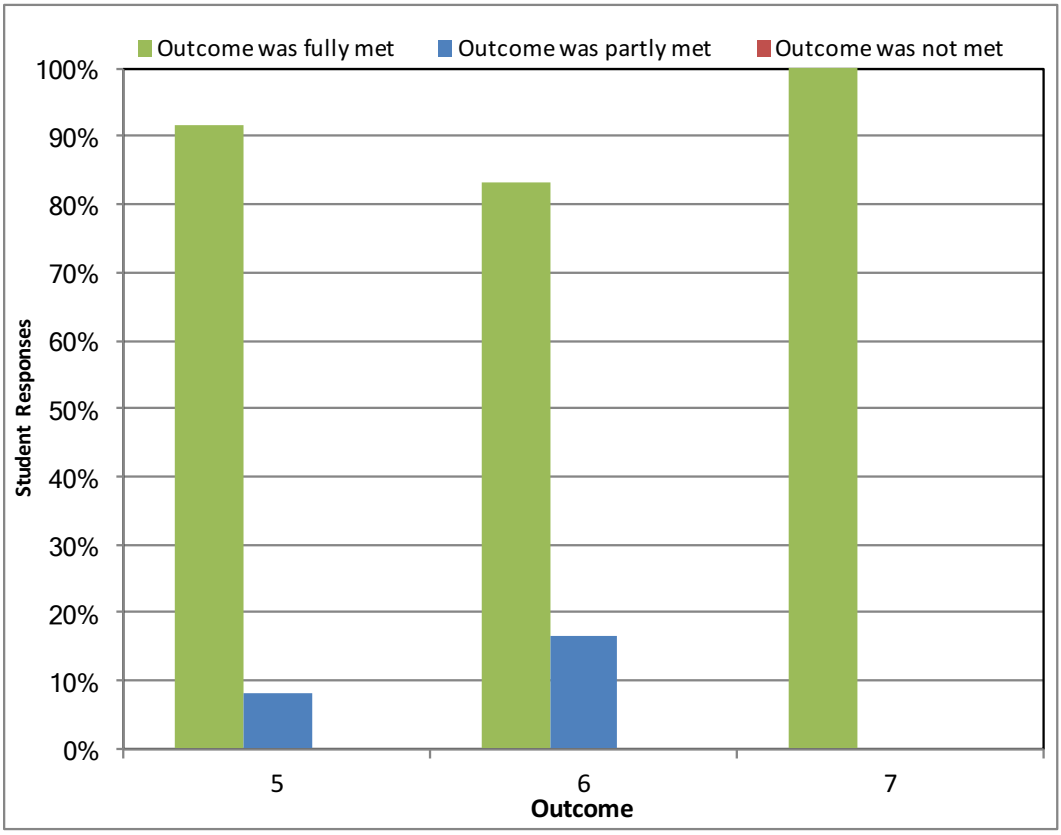



Figure 7: Student exit interview ratings of progress on Outcomes 5, 6, and 7

***Summary***: The CEE Assessment Committee met in June 2020 and evaluated all of the assessment data presented herein.

The evaluation of student work, FE Exam results, and senior exit interviews indicates that Outcomes 5, 6, and 7 are being met. However, we need to use the updated rubric for team work to assess Outcome 5 in the future. We also need to continue monitoring FE Exam performance on probability and statistics (formally assessed as part of Outcome 1).

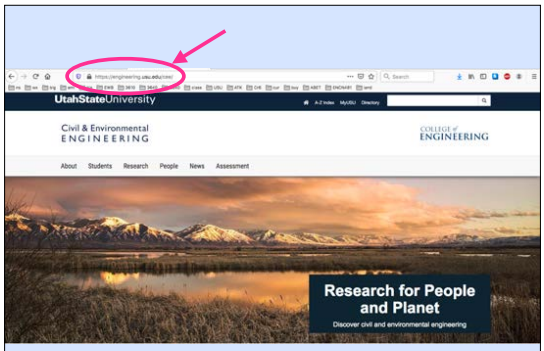
***Recommendations***

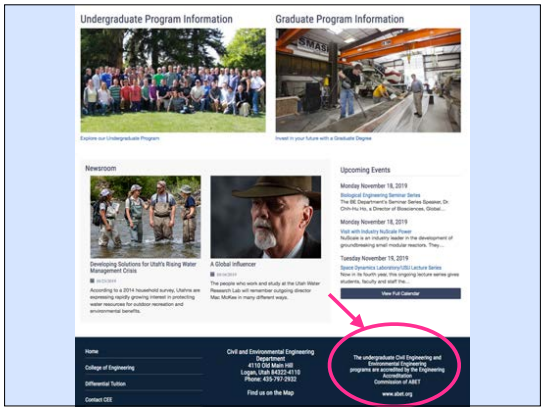
Evaluate outcomes 1, 2, 3, and 4 as planned during the 2020-2021 school year.

# Appendix A
# Slides from CEE 1880

## (introducing freshmen students to ABET PEOs and outcomes)

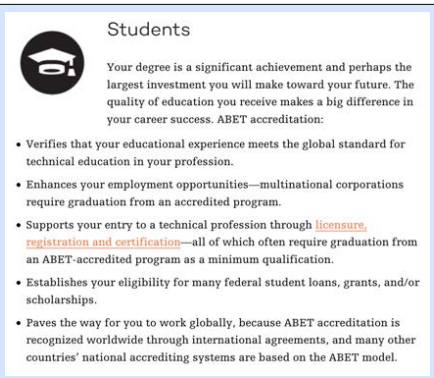
CEE graduating class, 2019




**The undergraduate Civil Engineering and Environmental Engineering programs are accredited by the Engineering Accreditation Commission of ABET**

www.abet.org



Students

Your degree is a significant achievement and perhaps the largest investment you will make toward your future. The quality of education you receive makes a big difference in your career success. ABET accreditation:

- Verifies that your educational experience meets the global standard for technical education in your profession.
- Enhances your employment opportunities—multinational corporations require graduation from an accredited program.
- Supports your entry to a technical profession through licensure, registration and certification—all of which often require graduation from an ABET-accredited program as a minimum qualification.
- Establishes your eligibility for many federal student loans, grants, and/or scholarships.
- Paves the way for you to work globally, because ABET accreditation is recognized worldwide through international agreements, and many other countries' national accrediting systems are based on the ABET model.

www.abet.org

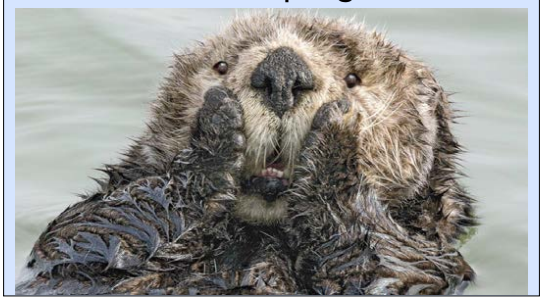
UTAH STATE LEGISLATURE | Audits | Bills | Budget | Code | Committees

Index Utah Code
Title 58 Occupations and Professions
Chapter 22 Professional Engineers and Professional Land Surveyors Licensing Act
Part 3 Licensure
Section 302 Qualifications for licensure. *(Effective 7/1/2017)*

*Effective 7/1/2017*
**58-22-302. Qualifications for licensure.**
(1) Each applicant for licensure as a professional engineer shall:
(a) submit an application in a form prescribed by the division;
(b) pay a fee determined by the department under Section 63J-1-504;
(c) provide satisfactory evidence of good moral character;
(d) (i) have graduated and received a bachelors or masters degree from an engineering program meeting criteria established by rule by the division in collaboration with the board; or
(ii) have completed the Transportation Engineering Technology and Fundamental Engineering College Program before July 1, 1998, under the direction of the Utah Department of Transportation and as certified by the Utah Department of Transportation;
(e) have successfully completed a program of qualifying experience established by rule by the division in collaboration with the board;
(f) have successfully passed examinations established by rule by the division in collaboration with the board; and
(g) meet with the board or representative of the division upon request for the purpose of evaluating the applicant's qualification for licensure.

**https://dopl.utah.gov/eng/**

# So what does it mean to have an accredited program?



# Program Educational Objectives

Within five years of graduation:

**PEO 1:** Graduates will be successfully employed in Civil (Env) Engineering or related careers and will become independent thinkers and effective communicators, team members, and decision makers.

**PEO 2:** Graduates will incorporate economic, environmental, social, ethical, and sustainability considerations into the practice of civil (env) engineering and will promote public health and safety.

**PEO 3:** Graduates will engage in life-long learning by pursuing advanced degrees or additional educational opportunities through coursework, professional conferences and training, or participation in professional societies.

**PEO 4:** Graduates will pursue professional licensure or other appropriate certifications.

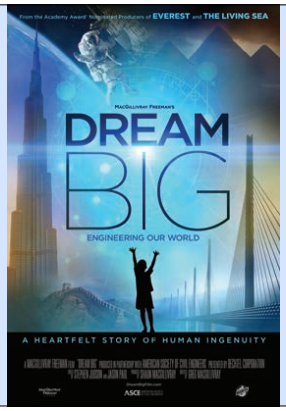
# Student Outcomes

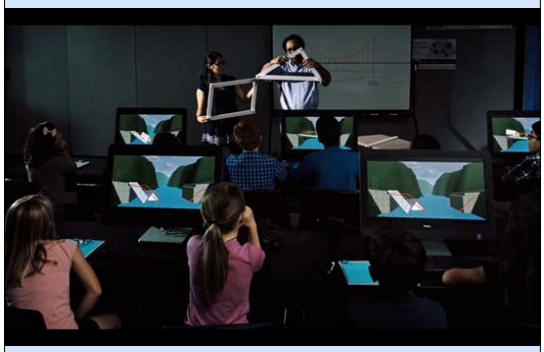
By the time of graduation, students will:

1. identify, formulate, and solve complex engineering problems
2. apply engineering design to produce solutions that meet specified needs with consideration of various factors
3. communicate effectively with a range of audiences
4. recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions
5. function effectively on a team
6. develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. acquire and apply new knowledge as needed

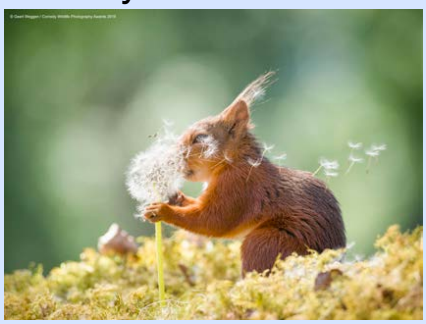
# ABET timeline

- ABET is a 6 year cycle
- Data collection during 2019-2020 school year:
  - submit examples of your course work
  - fill out a survey about our programs
  - fill out a survey about summer and permanent jobs
  - meet with our industrial advisory board
- Next site visit: Fall 2020 semester
  - meet with the Program Evaluator
  - spruce up your lab/office/hallway
  - help with a tour





## Any Questions?



## Appendix B
## Student Comments on PEOs from Exit Interviews

- I believe that our education should provide us with career targeted skills like drafting later on in our degree.
- I really like these PEOs and I plan to accomplish them all.
- I think these are fine PEOs but I felt ethics was not really addressed in enough detail during my duration as an undergraduate.
- I think these are great PEO's and like how they are focused on the employment and careers of the individual students. With things such as careers nights and professional lunches offered by the college it gives students an opportunity to get to know many different employees.
- I would argue that all PEOs were met.
- Seems like good goals, but I'm curious how they are measured.
- They sound like good objectives for each graduate to work towards. I am planning on continuing my education by attending grad school. After that I plan to obtain a job with a civil engineering firm.

Note: non-ABET related items have been removed from these minutes

## Appendix C
## Minutes of the CEE Advisory Board Meeting October 29, 2019

CEE 1880 Meeting with Students

- Text

ABET (Laurie)

- ABET timeline
  - ABET is a 6 year cycle
  - Next site visit: Fall 2020
  - Self study report due: July 1 2020
  - 2019-2020 school year is heavy on data collection
- Review program education objectives (handout)
  - Any feedback or changes from the board?
    - No
- Fe exam results (handout)
  - Department now requires students to pass the FE before they graduate
    - The board encourages this to stay as is
  - Pass rate for first-time test takers is high 70-low 90%
  - Our students are well above the national average
  - Civil students scored above national average in 10 of 18 topics
  - Environmental students scored above average in 4 of 14 topics, at the average for 9 to 14 topics, and below average in one topic
- Evaluation of students outcomes
  - A-k student outcomes now 1-7 (handout)
    - Very school year we assess a subset of outcomes
    - 2018-2019 we assessed outcomes 1-4
    - 2019-2020 will assess 5-7
- How the advisory board can help
  - Case studies and examples!
  - Meet with the ABET evaluator in Fall 2020

Note: non-ABET related items have been removed from these minutes

**Appendix D**
**CEE Annual Faculty/Staff Retreat Minutes**
**August 23, 2019**

- ABET 9:10-9:30 (Laurie McNeill)
  - ABET timeline
    - Abet is a 6 year cycle
    - Next site visit: fall 2020
    - Self study report due July 1 2020
    - 2019-2020 school year is heavy on data collection
      - Course binders
      - Facultiy info (cv, data tables)
      - Timely assessment data
  - PEOs
    - Handout
    - Within 5 years of graduation, students should feel they have met these objectives
    - Are these PEOs agreed upon, or do we need to make changes?
      - PEOs are agreed upon
  - Evaluation of student outcomes
    - Course work
    - FE exam
    - Senior Exit interviews
    - May 2019 outcomes 1, 2, 3, 4
      - Goal met
    - This year we will work on outcomes 5, 6, 7
  - To-Do
    - Handout
    - Faculty qualifications table
    - Send ABET CV to Haley (spring)
    - For all undergrad CEE clases:
      - Regular syllabus and ABET syllabus
      - Good/medium/poor (2/1/0) examples of all exams or major assignments
    - For all required UG CEE classes or design classes:
      - Assess at least two outcomes (5,6,7 or as discussed)

# Appendix E
# Detailed Evaluation for Outcomes 5, 6, and 7

See following pages

# Civil Engineering
# ABET Outcome Summary
# 2019-2020

**Outcome 5: an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives**

***Student Course Work Assessment***

Student work is rated on a 0 – 1 – 2 scale:

0 = student did not understand the fundamental principle or component
1 = student applied some but not all of the fundamental principles in their solution
2 = student applied the correct fundamental principles in their solution

The CE program has two goals for student performance for student course work assessment:

Goal 1: a minimum of 70% of the students will perform at a 2 level
Goal 2: a minimum of 80% of the students will perform at the 1 or 2 level.

Nearly all of the upper-division courses require some sort of team project, as does the capstone design sequence. Outcome 5 is assessed mainly via peer evaluations of student groups wherein students rate the performance of their teammates in a variety of areas, as well as by instructor evaluation and a quiz on team dynamics (Table 5-1, Figure 5-1). Student performance is satisfactory and meets both Goal 1 (88% rating a 2) and Goal 2 (91% rating a 1 or 2). However, several instructors of spring 2020 courses noted that teamwork was disrupted by the pivot to online teaching due to the COVID-19 pandemic, as indicated by the increase in 0 ratings (Table 5-1) compared to previous years' assessment of teamwork in outcome (d). We had also planned to use an updated rubric that specifically addresses each of the items listed in the outcome, but this plan was derailed by the pandemic. The rubric will be used starting in the 2020-21 school year.

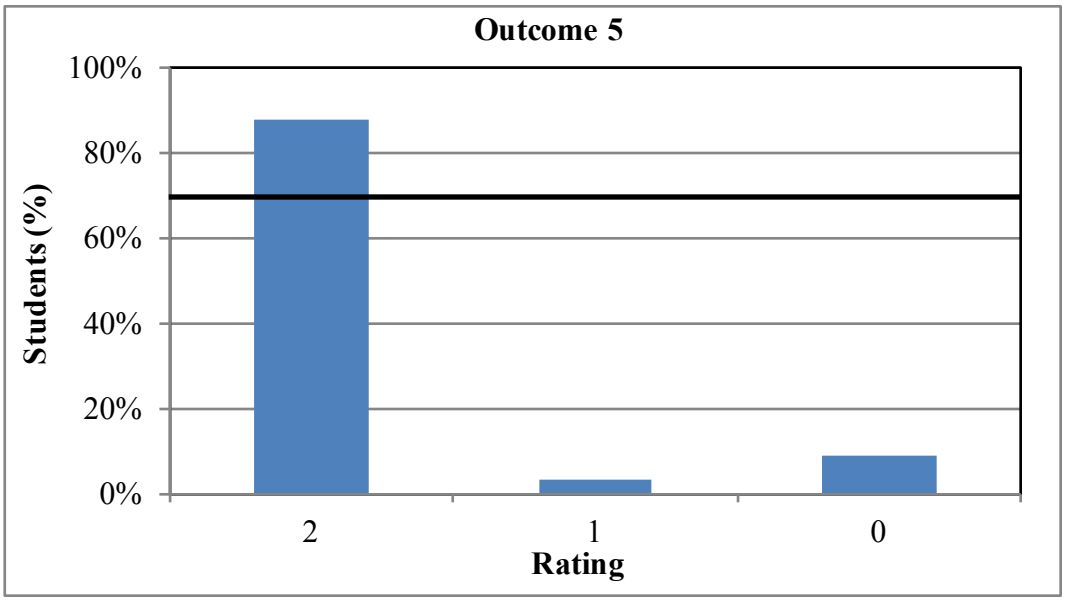


Figure 5-1: Summary of ratings of student work on Outcome 5

Table 5-1: List of student work assessed for Outcome 5

| Class | | Name | Instructor | Term | Enrol. | Method | Description | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|
| **2019-20** | | | | | | | | | | |
| CEE | 3640 | Drinking Water Engineering | Stevens | Sp 2020 | 31 | team project | peer and instructor evaluation | 97% | 3% | 0% |
| CEE | 3650 | Wastewater Engineering | Dupont | Sp 2020 | 18 | team project | peer evaluation | 83% | 11% | 6% |
| CEE | 3780 | Solid and Haz Waste Mgmt | Dupont | F 2019 | 20 | group project | peer evaluation | 45% | 45% | 10% |
| CEE | 3880 | CEE Design I | Ball | Sp 2020 | 63 | quiz on teams | quizzes on reading "The Five Dysfunctions of a Team" | 97% | 0% | 3% |
| CEE | 3880 | CEE Design I | Ball | Sp 2020 | 63 | group project | evaluation of team project proposal | 100% | 0% | 0% |
| CEE | 4870 | CEE Design II | Ball | F 2019 | 73 | group project | peer evaluation | 84% | 0% | 16% |
| CEE | 4880 | CEE Design III | Ball | Sp 2020 | 73 | group project | peer evaluation | 79% | 0% | 21% |
| CEE | 5930 | Green Infrastructure | Dupont | F 2019 | 23 | group project | peer evaluation | 96% | 0% | 4% |

***FE Exam Results***

Not applicable to this outcome

***Senior Exit Interviews***

Graduating seniors complete an anonymous online exit interview to provide feedback about the CE program and rate their perceived progress in meeting each of the outcomes. Student ratings of their own achievement on Outcome (5) is high. The program is clearly meeting the goal of ≥ 80% saying they "met" or "partly met" this outcome (Figure 5-2). Acknowledging that this is a subjective self-evaluation, these exit interview results are taken as a general indication that students feel they are meeting the outcome.

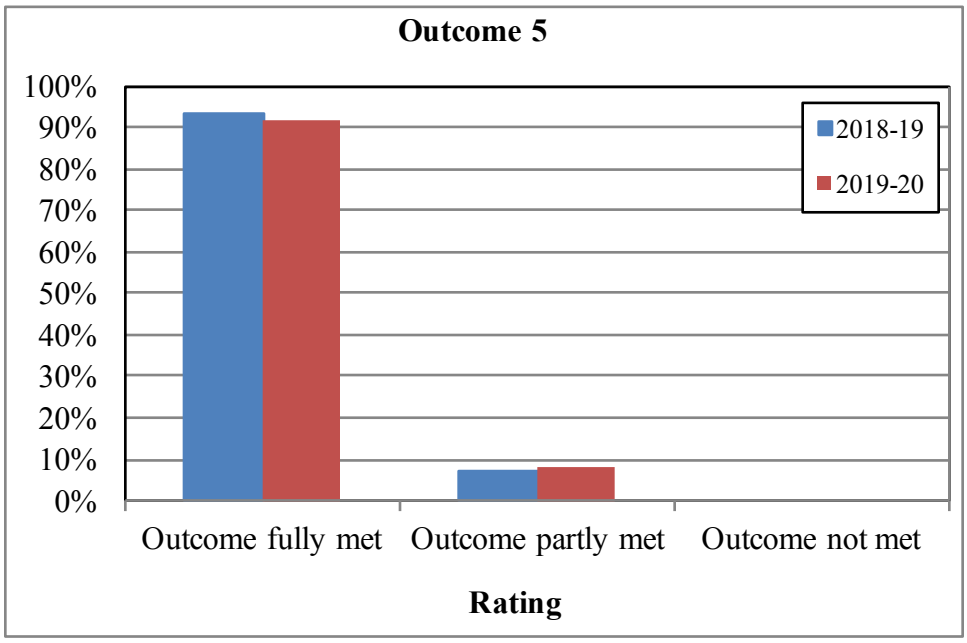



Figure 5-2: Student exit interview ratings of progress on Outcome 5

***Summary***

The evaluation of student work and senior exit interviews indicates that Outcome 5 is being met. The new rubric that specifically looks at all teamwork items listed in the outcome will be used starting in the 2020-21 school year.

***Recommendations***

Evaluate Outcome 5 as planned during the 2021-2022 school year.

# Civil Engineering
# ABET Outcome Summary
# 2019-2020

**Outcome 6: an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions**

***Student Course Work Assessment***

Student work is rated on a 0 – 1 – 2 scale:

0 = student did not understand the fundamental principle or component
1 = student applied some but not all of the fundamental principles in their solution
2 = student applied the correct fundamental principles in their solution

The CE program has two goals for student performance for student course work assessment:

Goal 1: a minimum of 70% of the students will perform at a 2 level
Goal 2: a minimum of 80% of the students will perform at the 1 or 2 level.

This outcome was assessed in the 2019-20 school year and both goals were met with 82% of students performing at the 2 level and 97% at the 1 or 2 level (Table 6-1, Figure 6-1). As discussed previously with outcome (b), the CE program has intentionally added exercises that require students to develop (design) and conduct experiments as well as analyze data, and these continue to be successful. The new "use engineering judgment to draw conclusions" aspect of the outcome has also been embraced.

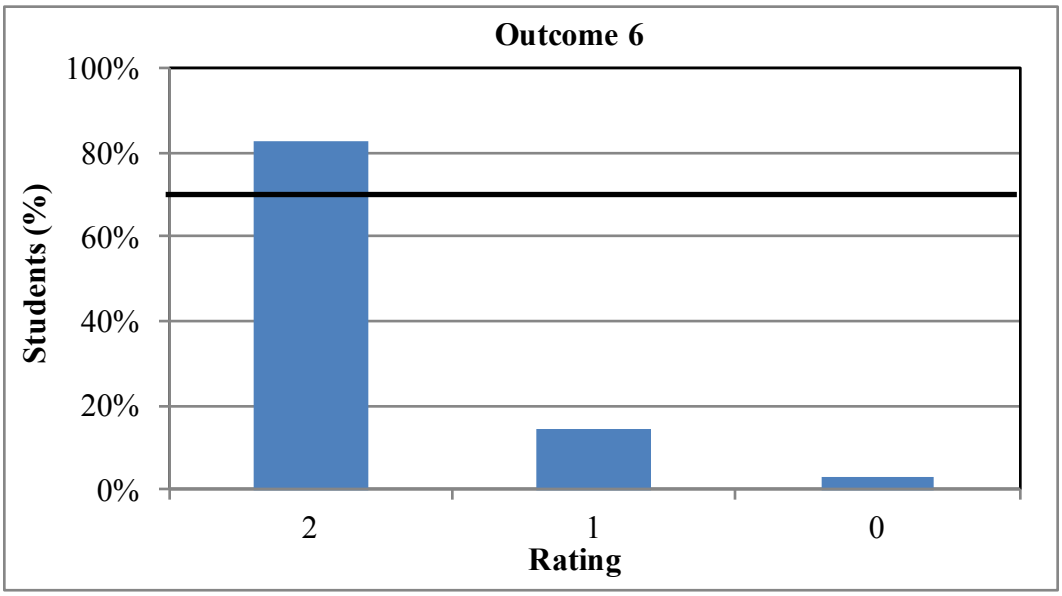



Figure 6-1: Summary of ratings of student work on Outcome 6

Table 6-1: List of student work assessed for Outcome 6

| Class | | Name | Instructor | Term | Enrol. | Method | Description | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|
| **2019-20** | | | | | | | | | | |
| CEE | 2240 | Engineering Surveying | Caliendo | F 2018 | 103 | lab | conduct expt, analyze data-trigonometric leveling with total station | 87% | 13% | 0% |
| CEE | 3080 | Reinforced Concrete Design | Laprevote | Sp 2020 | 47 | exam | use eng judgement to increase beam capacity | 74% | 23% | 2% |
| CEE | 3165 | Civil Engineering Materials Lab | Sorensen | F2018 | 65 | lab exercise | design experiment to test diff materials under loading, analyze data | 100% | 0% | 0% |
| CEE | 3165 | Civil Engineering Materials Lab | Sorensen | F 2019 | 65 | lab exercise | design experiment to test diff materials under loading, analyze data | 73% | 27% | 0% |
| CEE | 3430 | Engineering Hydrology | Neilson | Sp 2020 | 75 | HW | run and analyze HEC-HMS model results to design detention basin | 84% | 11% | 5% |
| CEE | 3500 | Fluid Mechanics | McKee | F 2019 | 72 | lab exercise | design expt to measure pipe roughness | 96% | 4% | 0% |
| CEE | 3510 | Hydraulics | Crookston | Sp 2019 | 75 | lab exercise | design experiment for various hydraulics topics, analyze/interpret data | 86% | 14% | 0% |
| CEE | 3610 | Environmental Management | McNeill | F 2019 | 74 | HW | analyze data from online water quality webpage | 76% | 5% | 19% |
| CEE | 3650 | Wastewater Engineering | Dupont | Sp 2020 | 18 | team project | analyze and interpret data, use eng judgment in for WW system | 22% | 78% | 0% |
| CEE | 4200 | Engineering Economics | Rosenberg | F 2019 | 71 | group project | analyze/interpret data, use eng. judgement: electric vs diesel buses | 79% | 17% | 4% |
| CEE | 4300 | Soil Mechanics | Caliendo | Sp 2019 | 63 | HW | compare spreadsheet to std charts for consolidation problem | 70% | 30% | 0% |
| CEE | 5010 | Matrix Analysis/ Finite Element | Barr | F 2018 | 24 | HW | analyze stress vs depth in plate using SAP, interpret results | 83% | 8% | 8% |
| CEE | 5540 | Hydraulic Structure Design | Tullis | F 2018 | 27 | lab exercise | determine head-discharge relationship for weirs (conduct expt, analyze/interpret data) | 96% | 4% | 0% |
| CEE | 5860 | Air Quality Management | Martin | F 2018 | 14 | group project | develop AERMOD model for emissions compliance, use judgement | 100% | 0% | 0% |

***FE Exam Results***

Not applicable to this outcome.

***Senior Exit Interviews***

Graduating seniors complete an anonymous online exit interview to provide feedback about the CE program and rate their perceived progress in meeting each of the outcomes. Student ratings of their own achievement on Outcome 6 are high and the program is meeting the goal of ≥ 80% saying they "met" or "partly met" this outcome (Figure 6-2). Note the students' self-assessment of this outcome is higher than previous years when this content was assessed as outcome b, likely reflecting the program's continued emphasis on these types of course activities. Acknowledging that this is a subjective self-evaluation, these exit interview results are taken as a general indication that students feel they are meeting the outcome.

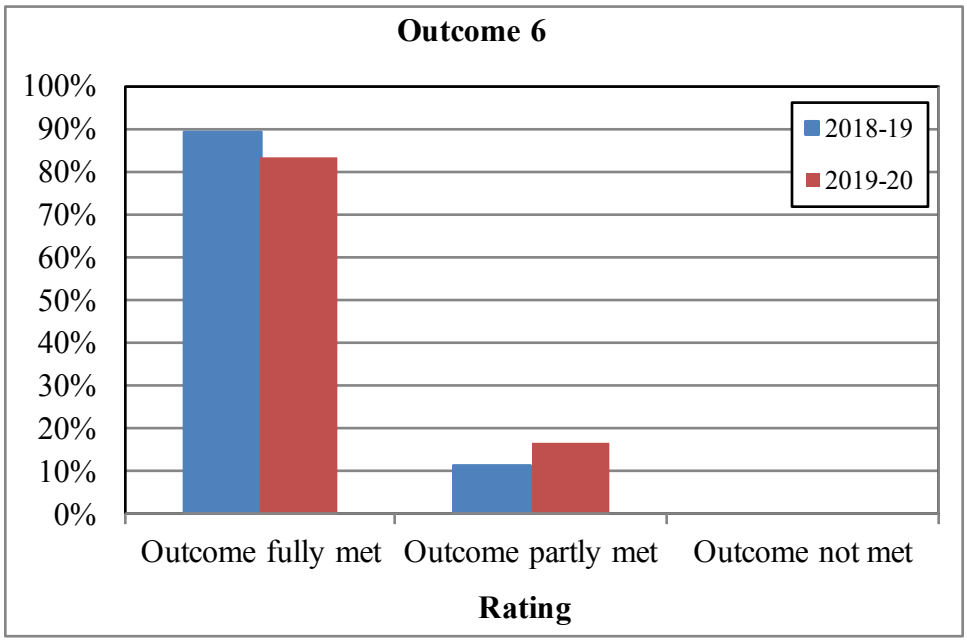



Figure 6-2: Student exit interview ratings of progress on Outcome 6

***Summary***

The evaluation of student work and exit interviews indicates that goals related to Outcome 6 are being met.

***Recommendations***

Evaluate Outcome 6 during the 2021-2022 school year as planned.

# Civil Engineering
# ABET Outcome Summary
# 2019-2020

**Outcome 7: an ability to acquire and apply new knowledge as needed, using appropriate learning strategies**

***Student Course Work Assessment***

Student work is rated on a 0 – 1 – 2 scale:

0 = student did not understand the fundamental principle or component
1 = student applied some but not all of the fundamental principles in their solution
2 = student applied the correct fundamental principles in their solution

The CE program has two goals for student performance for student course work assessment:

Goal 1: a minimum of 70% of the students will perform at a 2 level
Goal 2: a minimum of 80% of the students will perform at the 1 or 2 level.

This outcome was assessed in the 2019-20 school year and both goals were met (Figure 7-1). Ten courses across the curriculum assessed students' ability to gain and apply new knowledge through exploratory projects, field trips, and research and design projects (Table 7-1).

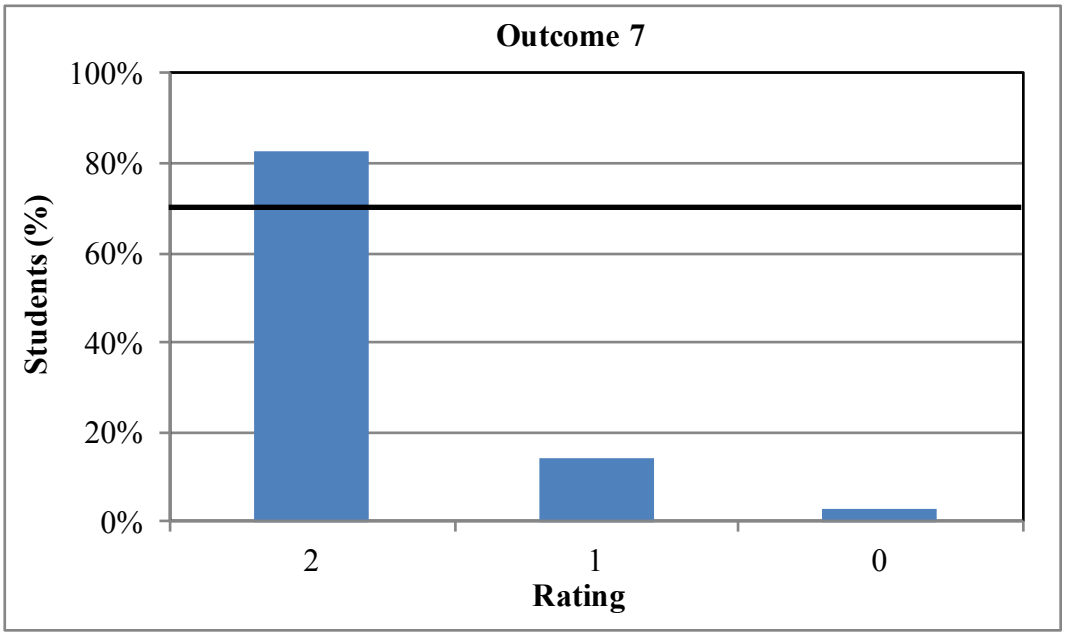



Figure 7-1: Summary of ratings of student work on Outcome 7

Table 7-1: List of student work assessed for Outcome 7

| Class | | Name | Instructor | Term | Enrol. | Method | Description | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|
| **2019-20** | | | | | | | | | | |
| CEE | 3210 | Intro. to Transportation Engineering | Mekker | Sp 2020 | 49 | research project | exploratory research project on lit review or data analysis | 51% | 45% | 4% |
| CEE | 3430 | Engineering Hydrology | Neilson | Sp 2020 | 75 | HW | apply new knowledge of water balances at field scale | 95% | 3% | 3% |
| CEE | 3610 | Environmental Management | McNeill | F 2019 | 74 | HW | field trip for onsite WW trt - answer questions and design exercises | 81% | 19% | 0% |
| CEE | 3780 | Solid and Hazardous Waste Mgmt | Dupont | F 2019 | 20 | group project | waste reduction and recycling plan for client | 85% | 15% | 0% |
| CEE | 4870 | CEE Design II | Ball | F 2019 | 72 | group project | various capstone design projects - concept and alternatives report | 79% | 21% | 0% |
| CEE | 4880 | CEE Design III | Ball | Sp 2020 | 73 | group project | various capstone design projects - final plan set | 93% | 7% | 0% |
| CEE | 5010 | Matrix Analysis/Finite Element | Barr | F 2019 | 27 | HW | research most appropriate method for solving nodal force problem | 74% | 11% | 15% |
| CEE | 5190 | GIS for CEE | Horsburgh | Sp 2020 | 21 | final project | explore GIS toolset to apply to an eng problem | 81% | 0% | 19% |
| CEE | 5220 | Traffic Engineering | Song | F 2019 | 9 | lab exercise | collect traffic data and learn how to do signal coordination | 100% | 0% | 0% |
| CEE | 5500 | Open Channel Hydraulics | Crookston | F 2019 | 23 | report | research flow resistance, write report on learning | 100% | 0% | 0% |

***FE Exam Results***

Not applicable to this outcome.

***Senior Exit Interviews***

Graduating seniors complete an anonymous online exit interview to provide feedback about the CE program and rate their perceived progress in meeting each of the outcomes. Student ratings of their own achievement on Outcome 7 is very high (Figure 7-2). The program is clearly meeting the goal of ≥ 80% saying they "met" or "partly met" this outcome. Acknowledging that this is a subjective self-evaluation, these exit interview results are taken as a general indication that students feel they are meeting the outcome.

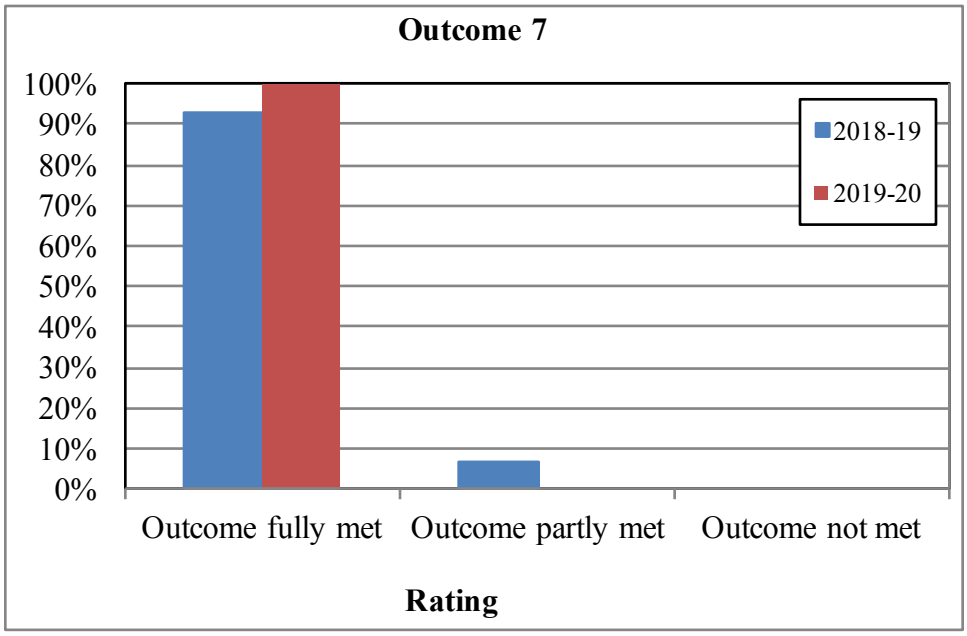



Figure 7-2: Student exit interview ratings of progress on Outcome 7

***Summary***

The evaluation of student work and exit interviews indicates that goals related to Outcome 7 are being met.

***Recommendations***

Evaluate Outcome 7 during the 2021-2022 school year as planned.