

## Bachelor of Science in Construction Engineering Program

FY 2016-2017 Student Learning Assessment Report  
Department of Construction Management and Engineering  
North Dakota State University

This report presents the assessment activities on student outcomes for the Bachelor of Science in Construction Engineering (CNE) Program in FY 2016-2017. The Department of Construction Management and Engineering (CM&E) continued the implementation of the assessment plan, which was submitted in the FY2013-2014 report.

### Mission Statement, Program Educational Objectives, and Student outcomes

The mission statement of the Department of Construction Management and Engineering remains the same as it has been in the previous years. The 5 Educational Objectives and 11 Student Outcomes of the Bachelor of Science degree program in construction engineering have also remained the same.

### Selected CNE Student Outcomes for Reporting

In FY2015-2016 academic year, the department reported on the second 4 of the 11 CNE Student outcomes (e, f, g & h) per UAC's reporting guidelines. Thus, it is appropriate to report on the last three of the student outcomes (i, j, k) for FY2016-2017 academic year to complete the cycle. The three ABET student outcomes are described in Table 1 with detailed three performance indicators (PI) for each student outcome.

Table 1: Three Remaining Student Outcomes

|   |  |
|---|--|
| (i) a recognition of the need for, and an ability to engage in life-long learning                             | <ul style="list-style-type: none"><li>▪ Demonstrates ability to learn independently</li><li>▪ Participates in learning activities outside of the classroom, including participation in professional and technical societies and industry experiences</li><li>▪ Recognizes the need to continuously update professional skills to solve new problems</li></ul>  |
| (j) a knowledge of contemporary issues  | <ul style="list-style-type: none"><li>▪ Demonstrates awareness of contemporary issues impacting construction, such as other engineering disciplines, economic, political, environmental, legal, and/or cultural issues</li><li>▪ Shows awareness of the current trends and events in construction engineering</li><li>▪ Participates in discussions of contemporary issues and offer insight into the issues as they relate to the construction engineering profession</li></ul> |
| (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice | <ul style="list-style-type: none"><li>▪ Selects appropriate techniques and skills (such as modeling, experimentation, measurement, and data analysis) for a construction tasks</li><li>▪ Uses computer-based and other resources effectively in assignments and projects</li><li>▪ Operates laboratory equipment appropriately, safely, and in a way that enhances problem solutions</li></ul>   |

### Construction Courses and Student Outcomes

Based on the course matrix reported in the FY2013-2014, a histogram of the number of times a student outcome is measured is depicted Figure 1. The number of times/course an ABET student

outcome is assessed varied from 1 (in the case of ABET accreditation criterion b) to 11(in the case of ABET accreditation criterion g). Using a minimum of two assessment data points, the critical student outcomes are (b) and (d) on the low end and (k) and (g) on the high end. It is apparent that student outcomes (g) and (k) are unduly assessed in the program. The mean count is approximately 6, the median is also 6 and the mode is 8. From table 2. ABET accreditation criterion (i) is measured in three courses; criterion (j) in six courses and criterion (k) in nine courses.

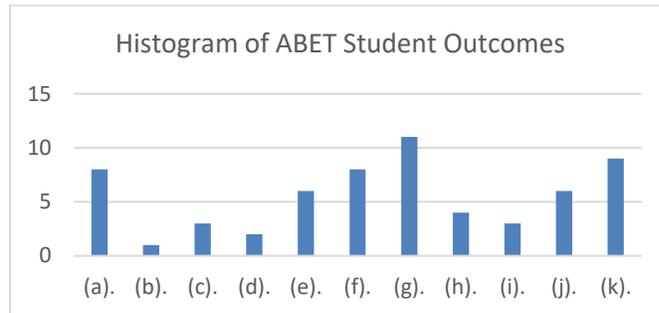


Figure 1: Histogram of ABET Student Outcomes.

Table 2: Construction Courses Selected for CNE Student Outcome Assessment

| Courses Number*                             | Semester | Student outcomes**  |   |      |        |
|---|----------|---|---|------|--------|
|   |          | i   | j | k    |        |
| CM&E 111                                    | Fall     | X   | X |      |        |
| CM&E 200                                    | Spring   |   |   | X    |        |
| CM&E 204                                    | Fall     |   |   | X    |        |
| CM&E 212                                    | Fall     |   |   | X    |        |
| CM&E 301                                    | Spring   |   |   | X(3) | sample |
| CM&E 305                                    | Fall     |   | X | X    |        |
| CM&E 315                                    | Spring   |   | X |      |        |
| CM&E 380                                    | Fall     |   |   | X    |        |
| CM&E 403                                    | Fall     |   | X | X    |        |
| CM&E 405                                    | Spring   | X   | X | X    |        |
| CM&E 489                                    | Spring   | X   | X | X    |        |
| * Course titles                             |          | CM&E 405 Support Operations   |   |      |        |
| CM&E 111 Intro to CM&E                      |          | CM&E 489 CNE Capstone   |   |      |        |
| CM&E 200 Documents & Codes                  |          | ** Student outcomes   |   |      |        |
| CM&E 204 Construction Surveying             |          | (i). An ability to identify, a recognition of the need for, and an ability to engage in life-long learning.     |   |      |        |
| CM&E 212 Construction Graphic Communication |          | (j). a knowledge of contemporary issues;  |   |      |        |
| CM&E 301 Construction Equipment             |          | (k). an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice. |   |      |        |
| CM&E 305 Pre-Construction Management        |          |   |   |      |        |
| CM&E 315 Specs & Contracts                  |          |   |   |      |        |
| CM&E 380 Construction Estimating            |          |   |   |      |        |
| CM&E 403 Scheduling and Project Control     |          |   |   |      |        |

### Assessment Methods

The methods used to collect assessment/accreditation data for the construction engineering program are: (1) Senior Graduation Survey, (2) Senior Exit Interviews by department Chair, (3) Senior Exit Interviews by IAC Members, (4) Alumni Survey, (5) Employer Survey, (6) Student Rating of Instruction (SROI), (7) Faculty Course Assessment Report (FCAR), (8) IAC Course Review, and (9)

FE Exam Results. For the remaining 3 student outcomes, a total of four methods are used for the assessment in this report: (1) Senior Graduation Survey; (3) Senior Exit Interviews by IAC members; (6) SROI; and (7) FCAR.

The electronic senior exit/graduation interviews are performed and compiled by NDSU. There is a question that is directly or indirectly related to each of ABET's (a) to (k) student outcomes. The target score is 80% (4 out of 5).

This face-to-face interview is conducted and recorded by the department's Industry Advisory Board at the end of each semester. The department is not involved in the interview. This statistic/information serves as a type of audit by a group of outsiders; lending credibility to the process. The question that is most useful for the assessment is as follows "How would you rank the educational experience in the CM&E Department (1 to 10, 10 being the highest)? The target is 80% (8 out of 10).

The student rating of instruction is a standard course assessment report which is compiled from an in-class course assessment conducted by an independent person during the last two or three weeks of the semester. The course assessment report consists of several questions. However the question that is used in the department's assessment reporting the most is Question 11: "I met/exceeded the course objectives for this course". A score of 4 out of 5 (80%) is the benchmark.

In the case of the FCAR, CNE course instructors use various student class activities to evaluate if students are achieving the course student outcomes. These activities include assignments, exams, quizzes, projects, papers, presentations, labs, and class participation. The program's target is on 80% attainment level of any student outcome by weighted the applicable measurement results. The program's target is on 80% attainment level of any student outcome by weighted the applicable measurement results.

### **Assessment ABET Criteria (i), (j) and (k)**

Table 4 lists the tools that were used to assess the three (3) student outcomes. In the case of graduation survey, questions O4, T13 and TM3 were used for outcomes (i), (j), and (k) respectively. A minimum of three (3) courses were used for SORI and FCAR statistics. A statistics from the IAC exit interviews was also used. The weights of the assessment tools are listed in Table 3.

### **Discussion of Results**

A simple mean was used to calculate each line item. For instance, the source of information and calculation of the student outcomes from the senior graduation survey is depicted in Table 4.

The graduation survey questions are grouped into nine (9) categories: General (G), Teaching (T), Communication Skills and Teamwork (C), Mathematical and Science Preparation (M), Techniques and Modern Tools (TM), Overall Education (O), Advising (A), Practical Experience (E), and Plans after Graduation (P). Seniors are asked to respond to questions using a scale of 1-5. The program aims for an average value of 4 or above, and if the average value is below 4, corrective action will need to be taken in the specific area.

A column chart of the SORI (Q11) is depicted in Figure 2.

Table 3: Assessment Tools.

| Assessment Tools          | Student Outcomes (Benchmark = 80%) |                                  |                                  |
|---------------------------|------------------------------------|----------------------------------|----------------------------------|
|                           | (i)                                | (j)                              | (k)                              |
| Graduation Survey: 10%    | O4                                 | T13                              | TM3                              |
| 3 courses SORI (Q11): 40% | CM&E 111 CM&E 405 CM&E 489         | CM&E 305<br>CM&E 403<br>CM&E 405 | CM&E 200<br>CM&E 301<br>CM&E 489 |
| FCAR: 40%                 | CM&E 111 CM&E 301 CM&E 489         | CM&E 111<br>CM&E 405<br>CM&E 489 | CM&E 204<br>CM&E 301<br>CM&E 403 |
| IAC Exit Interviews: 10%  | Question 2                         | Question 2                       | Question 2                       |
| Weighted Average          |                                    |                                  |                                  |
| <b>Overall Attainment</b> |                                    |                                  |                                  |

Table 4: CNE Senior Graduation Survey Results

| Please respond to the following statements by circling one of the five categories unless otherwise specified:<br>1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, or 5 = Strongly Agree<br>Please feel free to give your specific comments on each area |   |    |   |   |   |    |      |     |
|---|---|----|---|---|---|----|------|-----|
| No.   |   | SD | D | N | A | SA |      |     |
| O4  | My program of study communicated the need for, and developed my abilities to engage in life-long learning (i).  |    |   |   | 3 | 1  | 4.25 | 85% |
| T13   | My knowledge of contemporary issues was developed through major course instruction (j).   |    |   | 2 | 2 |    | 3.50 | 70% |
| TM3   | My major courses have prepared me adequately to use the techniques, skills, and modern engineering tools necessary for construction engineering practice (k). |    |   | 2 | 2 |    | 3.50 | 70% |

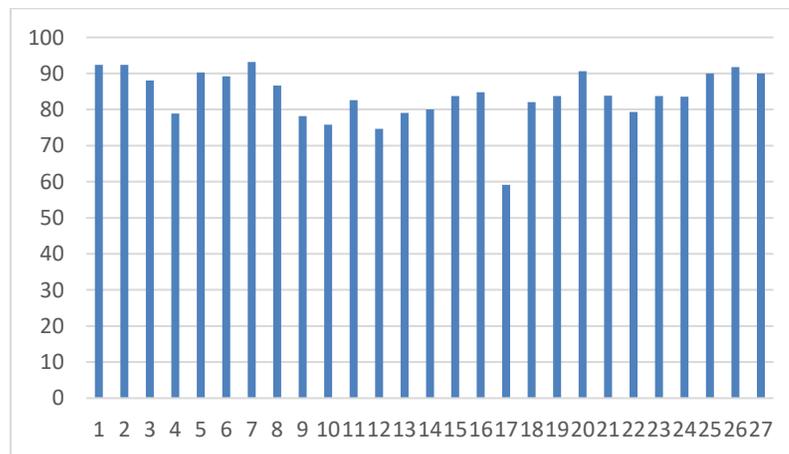


Figure 3: Histogram of SORI Q11 – learning outcomes.

The mean, median and mode of the SORI are 83.99, 83.76 and 83.76 respectively; approximating a score of 84%.

The results of the assessment are summarized in Table 5. In summary the weighted averages of all the outcomes are above 80% bench mark. The graduation scores were a little lower than expected, as outcomes (i) and (j) received a score of 70%. The SORI values are well above average, with the least being 83.2%. The IAC exit interview result was a little below the 80% benchmark. The least FCAR result was 87 and the highest was 94.2

The department as part of the College of Engineering has been involved in ABET assessment over the past several years. A number of rigorous assessment processes have been invented and applied and on no occasion has ABET questioned the processes used by the department in assessing student outcomes. That being said the department continues to improve our processes and analyses of the results to ensure students outcomes are achieved, maintained and improved.

Table 5: Results of Assessment of Student Outcomes (i), (j), and (k).

| Assessment Tools          | Student Outcomes (Benchmark = 80%) |       |       |
|---------------------------|------------------------------------|-------|-------|
|                           | (i)                                | (j)   | (k)   |
| Graduation Survey: 10%    | 85                                 | 70    | 70    |
| 3 courses SORI (Q11): 40% | 88.7                               | 83.2  | 86.0  |
| FCAR: 40%                 | 89.8                               | 87    | 94.2  |
| IAC Exit Interviews: 10%  | 77.5                               | 77.5  | 77.5  |
| Weighted Average          | 87.65                              | 82.83 | 86.83 |
| <b>Overall Attainment</b> |                                    |       |       |

### Continuous Improvements

Faculty members have been involved in the ABET assessment process and especially extensively involved in the FACR analysis every semester. There are several suggestions for continuously improving outcome assessment including review comments from last year report. To address these suggestions or comments. Faculty members have done the following changes:

- The capstone class has been significantly changes and improved.
- Multiple faculty members attended ABET assessment workshops

In conclusion, various instruments were used to assess three learning outcomes to complete the ABET assessment process commenced about three years ago. The three outcomes were all satisfactory as their values were above the 80% benchmark.