Construction Engineering Management Technology (CEMT)

Assessment Plan and Report

Mission

The Construction Management and Engineering Technology Program provides an innovative and challenging curriculum in a “student-centered” learning environment to prepare our graduates for successful careers in the construction industry.

Program Outcomes

These outcomes describe the career and professional accomplishments that we expect our graduates to achieve early in their careers.
1. To develop and maintain a sustained program of continuing education and life-long learning.
2. To practice effective written and oral communication and successfully participate within an interdisciplinary team environment.
3. To demonstrate an ability to apply problem solving skills and integrate technical knowledge.
4. To be engaged construction professional who comprehends the ethical, social, environmental, and economic impacts of construction decisions and solutions.
5. To be engaged citizens who seek service and leadership roles in professional societies and organizations, as well as the community.

Program (Student) Learning Outcomes

Upon graduation from an accredited ACCE 4-year degree program, a graduate shall be able to:
1. Create written communications appropriate to the construction discipline.
2. Create oral presentations appropriate to the construction discipline.
3. Create a construction project safety plan.
4. Create construction project cost estimates.
5. Create construction project schedules.
6. Analyze professional decisions based on ethical principles.
7. Analyze construction documents for planning and management of construction processes.
8. Analyze methods, materials, and equipment used to construct projects.
9. Apply construction management skills as a member of a multi-disciplinary team.
10. Apply electronic-based technology to manage the construction process.
11. Apply basic surveying techniques for construction layout and control.
12. Understand different methods of project delivery and the roles and responsibilities of all constituencies involved in the design and construction process.
13. Understand construction risk management.
15. Understand construction quality assurance and control.
16. Understand construction project control processes.
17. Understand the legal implications of contract, common, and regulatory law to manage a construction project.
18. Understand the basic principles of sustainable construction.
19. Understand the basic principles of structural behavior.
20. Understand the basic principles of mechanical, electrical and piping systems.
ASSESSMENT TOOLS

Mission

The CEMT Mission Statement is reviewed on a five (5) year cycle which parallels the dates of the development of the Strategic Plans for the School of Engineering Technology and the CEMT Program. The next cycle for both Strategic Plans is 2018-2023. The Strategic Plan for the School was finalized at the end of May 2018 and was used to develop the CEMT Strategic Plan (2018-2023) as described in the previous section. The goal is to align the CEMT Strategic Plan with the initiatives of the Strategic Plan of the School.

The mission statement was reviewed by faculty and the CEMT IAB. Very minor wording changes were suggested and incorporated into the current mission statement.

Program Outcomes

The CEMT Program Outcomes describe the career and professional accomplishments that we expect our graduates to achieve early in their careers. The basic philosophy of assessing post-graduates (alumni) is to measure their level of achievement related to the Program Outcomes. It is impossible to measure these achievements at the time of graduation.

The assessment tool used to measure the Program Outcomes is the Alumni Survey which is sent to alumni who are one (1) to three (3) removed from graduation which is defined as “early in their careers.” The Alumni Survey is administered on a three-year cycle, the most recent survey was completed in May 2017. In the survey, each respondent rates each of the five (5) Program Outcomes on “how well” they have achieved each outcome using a 5-point scale (Very Well, Good, Adequate, Fair, and Poor).

Results of the Alumni Survey and Program Outcomes are discussed in the Evaluation Methodology section of this report.

Program (Student) Learning Outcomes

The Program Learning Outcomes are the ACCE Student Learning Outcomes (1-20). Both Direct Measures and Indirect Measures are used to assess and evaluate the Student Learning Outcomes.

The Indirect Measure uses the ACCE Student Learning Outcome Survey (Graduating Senior Exit Survey) the results of which are reported in Volume I: Indirect Measures (pages 28-29). This survey is administered every semester.

Within each course syllabus, the Student Learning Outcomes are listed for that course. Specific (and appropriate) Course Learning Outcomes are aligned with the Student Learning Outcomes. Methods of Direct Assessment are also listed on the syllabi. Direct Measures of the Student Learning Outcomes are performed at the course level using a variety of assessment tools, such as: assignments, quizzes, exams, papers, lab exercises, and oral presentations. A listing of the Course Learning Outcomes associated with the Student Learning Outcomes is in Volume II: Appendix E - Student Learning Outcomes vs. Course Learning Outcomes.

An individual Student Learning Outcome Report is generated for each Student Learning Outcome by the course instructor (or instructors in the case of shared outcome assessment). The Student Learning Outcome Reports are found in Volume II: Appendix D - Student Learning Outcome Reports (1-20).
These reports contain the results of the Indirect Measure, Direct Measures, Assessment of Student Work (using rubrics and grading criteria), and an Evaluation (Course Assessment Report). As described in the CEMT Assessment Implementation Plan, Student Learning Outcome assessment and evaluation is conducted on a 2½ year cycle.

Results of the Student Learning Outcomes are discussed in the Evaluation Methodology section of this report.

Course Learning Outcomes

The Course Learning Outcomes are assessed by the course instructors. Not all Course Learning Outcomes are evaluated in the Course Assessment Reports, unless there is an issue. The Course Assessment Report is reviewed by the Program Director and the CEMT Curriculum Committee. The Course Learning Outcomes are reviewed during the CEMT IAB Course Reviews and may be discussed at CEMT Program meetings. Course Learning Outcomes are identified on every CEMT course syllabus. Volume II: Appendix E shows the relationships between the Student Learning Outcomes and the Course Learning Outcomes.

Other Assessment Tools

First Destination Survey

As described in Volume I: 5.1.7.2 Employment Statistics (pages 49-51), graduating seniors complete this survey which is administered through the Career Center. The purpose of this survey is to track: post-graduation plans, type of employment, salaries, employers, and job titles. This survey is administered every semester.

Results of the First Destination Survey are discussed in the Evaluation Methodology section of this report.

Graduating Senior Exit Interviews

The Graduating Senior Exit Interviews is administered by the CEMT IAB and consist of a written section and an oral interview (which is transcribed by the IAB interviewers). The exit interviews are conducted every semester.

Results of the Graduating Senior Exit Interviews are discussed in the Evaluation Methodology section of this report.

Course Assessment Reports

During this initial ACCE accreditation process Course Assessment Reports were included in the Student Learning Outcome Reports. Course Assessment Reports were required in those courses that evaluated a Student Learning Outcome. Student Learning Outcome Reports are found in Volume II: Appendix D - Student Learning Outcome Reports (1-20).

Employer Evaluation Survey - CEMT 39000 (Internship)

Every semester the employers evaluate the interns who are taking the internship for credit (CEMT 39000). The Employer Evaluation Survey is discussed in the Evaluation Methodology section of this report.
Student Evaluation Survey - CEMT 39000 (Internship)

Every semester the students evaluate their experiences with the internship that they are taking for credit (CEMT 39000). The Student Evaluation Survey is discussed in the Evaluation Methodology section of this report.

CEMT IAB Course Reviews

During the 2017 spring semester, select CEMT courses were reviewed by a member of the CEMT IAB who had an interest and experience with the subject matter of that course. The assessments were meant to be formative and for use by the course instructors. The course reviews included an interview with the course instructor and a classroom visit during a lecture and/or lab. Select CEMT IAB Course Reviews are in Appendix C.3.

PERFORMANCE CRITERIA

Program Outcomes
Alumni will average 80% (a “Good” rating) on each of the five Program Outcomes on the Alumi Survey.

Program (Student) Learning Outcomes
For this initial accreditation, the performance criteria for the Indirect Measure was that an overall average of the total assessment (from the Direct Measures) for each Student Learning outcome should be at least 75%.

First Destination Survey
At least 90% of graduates will be meaningfully employed in the construction industry.

Graduating Senior Exit Interviews
For the written exit interview question, rating of at least 80% is expected. The IAB conducts the oral interviews and transcribe the results. Input for every student (100%) is expected.

Course Assessment Reports
100% report submission and inclusion in the Student Learning Outcome Reports.

Employer Evaluation Survey - CEMT 39000 (Internship)
80% of the interns should receive an Outstanding or Above Average performance rating.

Student Evaluation Survey - CEMT 39000 (Internship)
80% of the interns should Strongly Agree or Agree that the internship experience was positive.

CEMT IAB Course Reviews
Since the course reviews are formative and for use by the course instructor, performance criteria were not developed as part of this assessment. Course Reviews are described in more detail in the Evaluation and methodology section.
EVALUATION METHODOLOGY

Program Outcomes

These outcomes describe the career and professional accomplishments that we expect our graduates to achieve early in their careers. The survey was conducted in May 2017. A copy of the survey results can be found in Appendix C.1 - Program Outcomes of this report.

<table>
<thead>
<tr>
<th>Program Outcome (n=13)</th>
<th>Percent Achievement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To develop and maintain a sustained program of continuing education and life-long learning.</td>
<td>87.7%</td>
</tr>
<tr>
<td>2. To practice effective written and oral communication and successfully participate within an interdisciplinary team environment.</td>
<td>87.7%</td>
</tr>
<tr>
<td>3. To demonstrate an ability to apply problem solving skills and integrate technical knowledge.</td>
<td>93.3%</td>
</tr>
<tr>
<td>4. To be engaged construction professional who comprehends the ethical, social, environmental, and economic impacts of construction decisions and solutions.</td>
<td>87.7%</td>
</tr>
<tr>
<td>5. To be engaged citizens who seek service and leadership roles in professional societies and organizations, as well as the community.</td>
<td>63.1%</td>
</tr>
</tbody>
</table>

The target goal for the Program Outcomes was that alumni will average 80% (a “Good” rating) on each of the five Program Outcomes. All were achieved except for number five (5). Based on the written comments from the respondents, most felt that it was too early in their careers to serve in leadership roles, specifically in professional societies and organizations, which is to be expected.

The 2020 Alumni Survey (Program Outcomes) will be sent to three groups: 1.) 1 -3 years after graduation, 2.) 3 - 6 years after graduation, and 3.) more than 6 years after graduation. Using Qualtrics, the survey will be expanded to include demographic data (name, title, company, years of experience, etc.). In addition, to Program Outcomes, additional questions will be asked about the CEMT program and curriculum.

Program (Student) Learning Outcomes

The percentages for the Direct Measures were calculated by the course instructor(s) responsible for the given Student Learning Outcome. The complete versions of the Student Learning Outcome Reports are found in Volume II: Appendix D - Student Learning Outcome Reports (1-20) Reports.

The Indirect Measure was compiled from the ACCE Student Learning Outcome Survey (Graduating Senior Exit Survey). Copies of the submitted surveys will be available to the visiting team during the site visit.

<table>
<thead>
<tr>
<th>ACCE Student Learning Outcomes</th>
<th>Direct %</th>
<th>Indirect %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Create written communications appropriate to the construction discipline.</td>
<td>86.6</td>
<td>92</td>
</tr>
<tr>
<td>2. Create oral presentations appropriate to the construction discipline.</td>
<td>93.5</td>
<td>94</td>
</tr>
<tr>
<td>3. Create a construction project safety plan.</td>
<td>97.5</td>
<td>88</td>
</tr>
<tr>
<td>4. Create construction project cost estimates.</td>
<td>80.0</td>
<td>90</td>
</tr>
<tr>
<td>5. Create construction project schedules.</td>
<td>73.0</td>
<td>88</td>
</tr>
<tr>
<td>6. Analyze professional decisions based on ethical principles.</td>
<td>80.0</td>
<td>94</td>
</tr>
<tr>
<td>7. Analyze construction documents for planning and management of construction processes.</td>
<td>83.4</td>
<td>98</td>
</tr>
<tr>
<td>8. Analyze methods, materials, and equipment used to construct projects.</td>
<td>80.0</td>
<td>88</td>
</tr>
</tbody>
</table>
9. Apply construction management skills as a member of a multi-disciplinary team.  
10. Apply electronic-based technology to manage the construction process.  
11. Apply basic surveying techniques for construction layout and control.  
12. Understand different methods of project delivery and the roles and responsibilities of constituencies involved in the design and construction process.  
13. Understand construction risk management.  
15. Understand construction quality assurance and control.  
16. Understand construction project control processes.  
17. Understand the legal implications of contract, common, and regulatory law to manage a construction project.  
18. Understand the basic principles of sustainable construction.  
19. Understand the basic principles of structural behavior.  
20. Understand the basic principles of mechanical, electrical and piping systems.

For this initial accreditation, the performance criteria for both the Direct and Indirect Measures for each of the 1-20 Student Learning Outcomes was a minimum of 75%. All were achieved except SLO 5 - Create construction project schedules, which is addressed below in 5 and SLO1. Understand the basic principles of sustainable construction. Create construction project schedules.

The evaluations for each Student Learning Outcome is presented below and include course improvements and corrective actions.

1. Create Written Communications Appropriate to the Construction Discipline.

CEMT 39000: Construction Experience (Charles McIntyre)

The Direct Measure for SLO 1 was the Work Report compiled from three semesters, as indicated below. The maximum grade (points) for the Work Report is 50.

<table>
<thead>
<tr>
<th>Term</th>
<th>N</th>
<th>Work Report</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring 2017</td>
<td>5</td>
<td>44.5</td>
<td>89.0</td>
</tr>
<tr>
<td>Summer 2017</td>
<td>19</td>
<td>40.7</td>
<td>81.4</td>
</tr>
<tr>
<td>Fall 2017</td>
<td>5</td>
<td>45.0</td>
<td>90.0</td>
</tr>
<tr>
<td>Total Average</td>
<td></td>
<td>42.1</td>
<td>84.2</td>
</tr>
</tbody>
</table>

Since this is the initial ACCE accreditation for the CEMT program, it was decided that an overall average of the total grades should be at least 75%. The Indirect Measure (92%) and the Direct Measure (86.6%) indicate that the target value was met.

Proposed Actions for Course Improvement:

Virtually, all academic programs in the School of Engineering and Technology use the Career Center to administer their internships, whether they are required as part of the curriculum or are an elective course. The format of the course has been standardized, but there is room for flexibility, based on the needs of an academic program. For the past two semesters, CEMT program has required the use of NoteVault during the internships. NoteVault is a software communication program that sends and
receives notes and pictures from the jobsite to the home office, and vice versa. It is typically accessed via an app on a cell phone.

In CEMT 39000, students are requested to send at least one note per week to the course instructors as a progress report on what tasks they accomplished in a given week. Most students comply with the request to create a weekly report; however, it is not yet part of the Grade Performance Criteria. It is anticipated that the weekly reports will be a component of the grading criteria beginning with the 2018 fall semester and included as a part of the written report requirements. The value for the students is that they are competent and well-versed in an emerging technology that is used in the construction industry and will only increase in the future. This serves to increase their marketability and raise the level of use of this technology in the construction industry, since many firms have not adopted this type of communication platform.

2. Create Oral Presentations Appropriate to the Construction Discipline.

CEMT 44700: Construction Project Management (Charles McIntyre & Marvin Johnson)

The Direct Measure for SLO 2 was assessed using the Oral Presentation Rubric (80 pts.). The average grade and percent are presented below.

<table>
<thead>
<tr>
<th>Individual Oral Presentation</th>
<th>N</th>
<th>Average Grade (80 pts)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring 2018</td>
<td>25</td>
<td>74.8</td>
<td>93.5</td>
</tr>
</tbody>
</table>

Since this is the initial ACCE accreditation for the CEMT program, it was decided that an overall average of the total grades should be at least 75%. The Indirect Measure (94%) and the Direct Measure (93.5%). Assuming an equal weight for each measure the composite grade was 93.75% indicating that the target value was met. The individual oral presentations graded rubrics will be available to the visiting team at the site visit.

Proposed Actions for Course Improvement:

After discussions with the faculty and CEMT IAB members, a few modifications to the rubric used to evaluate the oral presentations.

- Solicit comments from the reviews on suggestions for improving the rubric.
- Correct minor wording changes in the rubric
- Distribute the rubric to the reviewers a week before the presentations.


CEMT 45500: Construction Safety and Inspection (Tina Griesinger)

The Direct Measure for SLO 3 was the Safety Plan. There were 35 students in this class. The maximum grade (points) for the Work Report is 200. The table below shows the average grade (based on 200 points) and the percentage (based on100%).

<table>
<thead>
<tr>
<th>Term</th>
<th>N</th>
<th>Safety Plan</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2017</td>
<td>35</td>
<td>195</td>
<td>97.5%</td>
</tr>
</tbody>
</table>
Since this is the initial ACCE accreditation for the CEMT program, it was decided that an overall average of the total grades should be at least 75%. The Indirect Measure (88%) and the Direct Measure (97.5%) indicate that the target value was met.

**Proposed Actions for Course Improvement:**

1. **Integrate OSHA 10 certification.** The material covered in CEMT455 closely aligns with the requirements necessary for OSHA10 certification. It would be beneficial for the CEMT program to integrate OSHA 10 training for future offerings of CEMT455. As many of the students are either interns in the construction industry or work in construction in a different capacity, this is also a recommendation on behalf of the students. Comments from the end of the course survey support this suggested improvement as shown below:

2. **Adjust time allotment for safety presentation from 20-30 minutes to 15-20 minutes per student.** Although the longer time allotment worked well with smaller class sizes in the past, it was necessary to use additional sessions to accommodate the time necessary for 35 presentations. Students could adequately cover their safety topic in 15-20 minutes. Overall, the students not only gained knowledge from their own safety research, they were also able to learn from their peers and also participate in the peer valuation process.

3. **Upgrade safety plan grading rubric.** Refine criteria and provide students a detailed version of specific expectations.

4. **Integrate case studies** by analyzing current safety violations under investigation. Students will predict outcome based on OSHA CFR 1926 standards. This project will give students the opportunity to learn through inductive reasoning and team-based learning. Teams will work together to investigate and determine the cause of the safety breach.

5. **Invite industry safety program managers.** Students will benefit from interacting with safety professionals in the classroom. Schedule four speakers per semester from four different construction disciplines to provide a real-life connection between classroom work and industry application.

6. **Create analyzation opportunities.** As reflected in the student course survey below, students learn the necessary details for successful completion of CEMT455 by traditional methods focused on remembering and understanding. At this point in the CEMT program, students are adequately prepared to learn by analyzing and synthesizing. Problem based assignments based on previous construction safety disasters will provide opportunities to determine and interpret root cause and then develop an action plan detailing future avoidance.

4. **Create Construction Project Cost Estimates.**

**CEMT 34200: Construction Cost and Bidding (Matt Ray)**

**Direct Measures - Assessments and Evaluations**
The Direct Assessment consists of a lab assignment (custom designed to provide students an opportunity to create cost estimates covering multiple divisions for a given project throughout the semester) and a final group project (represents a culmination of lab experiences, creating a cost estimate and submitting a bid on a similar project).
The course includes multiple labs, with the Concrete Lab being one example. The individual labs are submitted each week as smaller portions of a larger lab project while the Final Project includes a larger portion of a project including multiple divisions, markups and additional submissions as part of the bidding process. Individual labs combined makeup 15% of the final grade while the final project alone counts for 20% of the final course grade. The final project is the culmination of the course experience and provides evidence of a student’s ability to successfully create a cost estimate. An average score of 80% was achieved for the direct assessment of SLO 4 - Create Construction Project Cost Estimates for CEMT 34200.

**Proposed Actions for Course Improvement:**

Since this is the initial ACCE accreditation for the CEMT program, it was decided that an overall average of the total grades should be at least 75%. Both the Concrete Lab and the Final Project were greater than 80% indicating that the target value was met.

I would say for SLO 4, on the final project students worked on the lab session in class with attendance optional after the initial instruction. I think forcing students to work on the project during lab time would improve the results by making the project a priority earlier on. The poor scores are not lack of knowledge but lack of time. The required time in class for working on the project is the change for the future.

**5. Create Construction Project Schedules.**

CEMT 35000: Construction Project Cost & Production Control (Charles McIntyre)

The Direct Measures consists of five assignments. The table below shows the average grades and percentages for the direct assessments.

<table>
<thead>
<tr>
<th>Direct Assessment</th>
<th>N</th>
<th>Average Grade</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Breakdown Structure for the Garage Project</td>
<td>24</td>
<td>18.5 / 20</td>
<td>92.5%</td>
</tr>
<tr>
<td>Garage Project - Costs</td>
<td>24</td>
<td>19.0 / 20</td>
<td>95.0%</td>
</tr>
<tr>
<td>Garage Project - MS Project</td>
<td>24</td>
<td>14.8 / 20</td>
<td>74.0%</td>
</tr>
<tr>
<td>Garage Project Schedule - Update (06/07/2018)</td>
<td>24</td>
<td>58.0 / 100</td>
<td>58.0%</td>
</tr>
<tr>
<td>Garage Project Schedule - Final Update</td>
<td>24</td>
<td>79.5 / 100</td>
<td>79.5%</td>
</tr>
</tbody>
</table>

Since this is the initial ACCE accreditation for the CEMT program, it was decided that an overall average of the total grades should be at least 75%. The Indirect Measure was 88% and the Direct Measure was 73.0%. I decided not to average those values. Based on the perception of graduating seniors (Indirect Measure), they felt confident in creating project schedules. The Direct Measure showed a different outcome. There could be several reasons that the target value (75%) was not met for the Direct Measure, as explained below.
Proposed Actions for Course Improvement:

There is no lab associated with this course, so students must complete the work in MS Project using the computer labs in the ET building or on-line via IUanyware. The computers in the labs are not easily accessible since many other classes are scheduled in the labs. IUanyware has issues also, mainly with printing and saving. I received several comments from students saying that they just could put the time to do a better job in completing the updating assignment (06/07/2018) and the grades reflected that.

Prior to the final assignment, I received authorization from Microsoft for the students to download MS Project on their personal computers via a link. The software was authorized for (free) use until the end of the semester and will be available in subsequent semesters for future 35000 student to use.

More convenient access to MS Project could be one of the reasons the grades on the final assignment were higher than the previous assignment. Fact is - the work was of higher quality on average for the final scheduling assignment. Student comments were very appreciative concerning authorization to download the software, basically for convenience sake.

MS Project - Every student in CEMT 35000, was in CEMT 34100 - Project Scheduling and Control (with me) the previous semester. In that class (which has a lab component) we spent every lab working with MS Project in some aspect. The hands-on approach in the lab proved to be a big help to many of the students as they tried to use the software. The CEMT program requires all students to have laptops (specific requirements are posted on the website). CEMT 35000 will never have a lab associated with the course, but since all students now have access to MS Project and can download the software on their laptops, an opportunity exists. Once we get to the MS Project part of the course, I plan to schedule one or two in-class work sessions to help students with the assignments and using MS Project (as a refresher from previous semester).

Canvas - I plan to enter the rubrics for the Garage Project assignments into Canvas to streamline the grading process. I anticipate some changes will occur concerning the grading criteria. In addition, I expect some changes to the assignments.

6. Analyze Professional Decisions Based on Ethical Principles.

CEMT 10500: Introduction to Construction Technology (Bill White)

The Direct Assessment consists of an ethics homework assignment. The table below shows the average grades and percentages for the direct assessments.

<table>
<thead>
<tr>
<th>Direct Assessment</th>
<th>N</th>
<th>Average Grade</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethics Assignment</td>
<td>7</td>
<td>40 / 50</td>
<td>80%</td>
</tr>
</tbody>
</table>

Since this is the initial ACCE accreditation for the CEMT program, it was decided that an overall average of the total grades should be at least 75%. The Indirect Measure (94%), the Direct Measure (80%) were greater than the target value or 75% which indicates the target percent was met.
Course Evaluation Results:

This was an unusual semester since only seven students were enrolled in the class - well below the average enrollment. Students had an increased amount of individual attention from the instructor, however, the grades did not reflect that. Several students just missed class too often and could not complete satisfactory work.

Proposed Actions for Course Improvement:

Related specifically to SLO 6 - Analyze Professional Decisions Based on Ethical Principles, there are a few actions that will be incorporated at the next course offering.

- There will be a new case study (Part I) with a focus on construction ethical issues.
- Create a rubric in Canvas, instead of using just comments.
- Invite a guest speaker from the local construction industry to speak about ethics.

7. Analyze Construction Documents for Planning and Management of Construction Processes.

CEMT 34700: Construction Contract Administration & Specifications (Bill White)

The Direct Measures were research questions, executive summary evaluation, and the semester project. The results of assessment of these measures is presented below.

<table>
<thead>
<tr>
<th>Direct Measures Calculated Summary</th>
<th>Weighted Average Grade %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Specification research questions</td>
<td>87.7%</td>
</tr>
<tr>
<td>2. Executive summary evaluation</td>
<td>78.9%</td>
</tr>
<tr>
<td>3. Semester Project</td>
<td>83.7%</td>
</tr>
<tr>
<td>Average</td>
<td>83.4%</td>
</tr>
</tbody>
</table>

Proposed Actions for Course Improvement:

The topics covered in the three assessed indicators all exceed the 75% benchmark. Therefore, no corrective action appears warranted at this time.

It doesn’t escape notice that the executive summary scores are 5% lower than the overall project score. This suggests a possible weakness in understanding the intricacies of interpreting the construction document data as they apply to the overall project. This outcome will be reviewed in subsequent assessments to determine if this relationship persists.

8. Analyze Methods, Materials, and Equipment Used to Construct Projects.

CEMT 33000: Construction Field Operations (Dan Koo)

The Direct Measure for SLO 8 was the Question and Answer, and Quiz. There were 24 students in this class. The table below shows the average percentage (based on 100%).

<table>
<thead>
<tr>
<th>Term</th>
<th>N</th>
<th>Criteria</th>
<th>Average Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring 2017</td>
<td>24</td>
<td>Quizzes</td>
<td>78.5 %</td>
</tr>
<tr>
<td>Spring 2017</td>
<td>24</td>
<td>Homework</td>
<td>80.6 %</td>
</tr>
</tbody>
</table>
The target for the overall average of the total grades is at least 75%. All three main evaluation criteria achieved over 75% of the target. The average was 80.0%.

Proposed Actions for Course Improvement:

Based on the indirect/direct measurements and IUPUI course evaluation, the course has currently met the target for the proposed student learning outcomes. However, some students do not fully understand, apply, and analyze the field operations using various types of equipment. It is mainly because the real-world job site does not perform the proper level of analysis of the equipment production, cost, and optimization of various plausible scenarios. Therefore, some students did not appreciate the value of theoretical analysis of the field operation. The course improvement is to reinforce the importance of theoretical knowledge for the analysis of the field operations and bring more actual field examples performed by the industry professionals so that the students can widen their view of the subject. The course objectives will be more specific rather than open-ended. Some students are afraid to provide open-ended answers and feel an insufficient level of instructions. The instructor will provide not only more specific conditions for analysis, but also open-ended problems that help an analytical thinking process.

9. Apply Construction Management Skills as a Member of a Multi-Disciplinary Team.

CEMT 44700: Construction Project Management (Charles McIntyre and Marvin Johnson)

The Direct Measure for SLO 9 was the assignment, “Applying Construction Management Skills as a Member of a Multi-Disciplinary Team.” The maximum grade (points) for this individual assignment was 100 points. The table below shows the average individual grade for this assignment.

<table>
<thead>
<tr>
<th>Multi-Disciplinary Assignment</th>
<th>N</th>
<th>Average Grade</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring 2018</td>
<td>25</td>
<td>88.0</td>
<td>88.0</td>
</tr>
</tbody>
</table>

Since this is the initial ACCE accreditation for the CEMT program, it was decided that an overall average of the total grades should be at least 75%. The Indirect Measure (94%) and the Direct Measure (88.0%). Assuming an equal weight for each measure the composite grade was 91% indicating that the target value was met.

Proposed Actions for Course Improvement:

Overall, the student response to the questions proposed by the role player were thoughtful and provided a depth of knowledge indicating that the students could apply their construction management skills to address the concerns from questions from other “non-construction” team members.

There are several proposed action items that could expand students ability to apply their construction management skills as members of a multi-disciplinary team, as outlined on the following page.

- In-class work session
- Questions related to multi-disciplinary teams at the oral presentations
- Separate meeting with group industry mentors to discuss multi-disciplinary teams
In-Class Work Session - Currently the assignment is done out of class. To possibly increase the effectiveness of the learning experience through class discussion, the assignment could be completed (or at least started in class).

Questions at the Oral Presentations - Prior to the oral presentations, seed questions could be distributed to industry members in attendance at the presentations. The quality of student responses to questions could be documented on the rubric used to evaluate the oral presentations. Industry feedback to the student responses could also be documented.

Group Mentor Meeting - Each capstone group is assigned an industry mentor from the CEMT IAB. The mentor meets with the group approximately 4 or 5 times a semester to discuss project progress and to provide guidance for assembling their materials and organizing and refining their presentation materials. One of these meetings could be dedicated to a discussion of multi-disciplinary teams. Students would document the discussions and provide some response to “lessons learned.”

10. Apply Electronic-Based Technology to Manage the Construction Process.

CEMT 10500: Introduction to Construction Technology (Bill White)

The Direct Measure consists of the Final Revit Report and five (5) exam questions.

<table>
<thead>
<tr>
<th>Direct Measures Calculated Summary</th>
<th>Weighted Average Grade %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Project One FINAL Revit Project</td>
<td>85.52%</td>
</tr>
<tr>
<td>2. Exam 4 Five Questions</td>
<td>71.00%</td>
</tr>
<tr>
<td>Average</td>
<td>78.3%</td>
</tr>
</tbody>
</table>

Proposed Actions for Course Improvement:

While the Revit project exceeded the 75% benchmark, the five exam questions did not. Even though an initial one-class assessment may not accurately capture the effectiveness of course material, given the unusually large class size the data merits a proactive approach to effect a positive learning outcome. Given that the weighted average missed the mark by 4%, additional class time will be spent addressing BIM and its capabilities.

11. Apply Basic Surveying Techniques for Construction Layout and Control.

CEMT 31200: Construction and Route Surveying (Sanjeev Adhikari)

Direct Measure for SLO 11 - Final Exam (Part I - Written and Part II - Practicum)

The table below shows the average grade for the Final Exam.

<table>
<thead>
<tr>
<th>Direct Assessment - Final Exam</th>
<th>Average Grade</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Exam (100 pts)</td>
<td>82.0</td>
<td>82.0</td>
</tr>
</tbody>
</table>
Since this is the initial ACCE accreditation for the CEMT program, it was decided that an overall average of the total grades should be at least 75%. The Indirect Measure (84%) and the average of the Direct Measure (82.0%) indicate that the target value was met.

Proposed Actions for Course Improvement:

- **Upgrade grading rubric for lab grading**: Refine grading criteria and provide students a detail version of specific expectations.
- **CAD Drawing**: This class requires students to prepare a map from collected survey data. Students have struggled on CAD drawing. We are planning to introduce civil 3D software.
- **Electronic data collector**: RECON data collector is about 15 years old and sometimes has problems communicating with total station. We are planning to fix this technical issue prior to lab class.
- **Weather Issue**: Weather is an issue in Indiana because of spring semester rain and snow. During snowy and rainy days, it is difficult for students to go outside to conduct lab. We are planning to prepare few lab handouts to work inside building, in case weather becomes an issue.


The Direct Measures for CEMT 34700 consists of: selected midterm exam questions, A201 Lab Exercise “It’s About Time,” and a Procore lab exercise.

<table>
<thead>
<tr>
<th>Direct Measures Calculated Summary</th>
<th>Average Grade %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Selected midterm exam questions</td>
<td>58.3%</td>
</tr>
<tr>
<td>2. A201 Lab Exercise “It’s About Time”</td>
<td>97.9%</td>
</tr>
<tr>
<td>3. Procore lab exercise</td>
<td>88.9%</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>81.7%</strong></td>
</tr>
</tbody>
</table>

Proposed Actions for Course Improvement:

As indicated in the table above, the average grade percentage for this outcome is 81.70%, which exceeds the benchmark of 75%. It must be noted that one indicator, the selected midterm questions, falls substantially below the 75% target and therefore deserves additional review.

To improve the average score on this indicator and the related indirect indicator, the following remedial actions will be taken:

1. An in-class activity will be created that requires students to discern the differences in delivery systems. It will present varying project scenarios requiring the student to select which delivery system would best address the unique characteristics of each project. In this way, the differences between delivery systems will become more apparent.
2. Additional class time will be spent presenting the topic, emphasizing the advantages and disadvantages of each delivery system we cover.

CEMT 44700: Construction Project Management (Charles McIntyre and Marvin Johnson)

The Direct Measure for SLO 13 was the “Risk Assessment Assignment.” The maximum grade (points) for this individual assignment was 80 points. The table below shows the average individual grades for this assignment.

<table>
<thead>
<tr>
<th>Risk Assessment Assignment</th>
<th>N</th>
<th>Average Grade</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring 2018</td>
<td>25</td>
<td>62.5</td>
<td>78%</td>
</tr>
</tbody>
</table>

Since this is the initial ACCE accreditation for the CEMT program, it was decided that an overall average of the total grades should be at least 75%. The Indirect Measure (88%) and the Direct Measure (78%). Assuming an equal weight for each measure the composite grade was 83% indicating that the target value was met.

Proposed Actions for Course Improvement:

It is anticipated that the topic of risk management will be enhanced in future course offerings. Documentation of the results of the class discussions is needed which will be accomplished with a follow up assignment.

The assignment will concern risk management as applied to the current capstone project. Students will be required to develop a risk management plan, for example:

- Define at least five (5) risks that are owned by the contractor (i.e., construction management team) that are specifically related to the current capstone project.

- Create a Risk Management Plan of how those risks are monitored and controlled throughout the project.

A framework will be created to assist the students in developing the risk management plan. A tentative outline of the plan is provided below. Additional insight will come from the industry mentors.

1. Risk Identification (what are the risks?)
2. Risk Responsibility (who owns the risks?)
3. Risk Assessment (what is the impact of the risks and how are the risks measured and ranked?)
4. Risk Response (what are measures for addressing the risks?)
5. Risk Mitigation (what is the contingency plan to deal with the risk should it occur?)
6. Risk Tracking a Reporting (what documentation is required?)

The Risk Management Plan will become part of the documentation for the Project Binder and part of their oral presentation. In addition, each group will create a Risk Assessment Matrix for each of their identified project specific risks and assign a measure of probability.
14 Understand Construction Accounting and Cost Control.

CEMT 34200: Construction Cost and Bidding (Matt Ray)

The Direct Assessment consists of a homework assignment (complete labor rate calculation with burden markup and equipment ownership and operating rate calculations), a lab assignment (multiple crew rate calculations) and three questions on the midterm exam (labor rate, crew rate and depreciation and interest calculations).

<table>
<thead>
<tr>
<th>Direct Assessment</th>
<th>N</th>
<th>Average Grade</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework Assignment</td>
<td>18</td>
<td>12.28/16</td>
<td>76.73</td>
</tr>
<tr>
<td>Lab Assignment</td>
<td>19</td>
<td>42.84/50</td>
<td>85.68</td>
</tr>
<tr>
<td>Midterm Exam Questions 19,22,23</td>
<td>19</td>
<td>8.84/12</td>
<td>73.68</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td></td>
<td></td>
<td>78.70</td>
</tr>
</tbody>
</table>

The portion of the homework assignment, lab assignment and midterm exam revealed that students were successful with crew and equipment rates and struggled more with the labor rate calculations. Both the lab assignment and homework assignment obtained an average score greater than 75% for the direct assessment of SLO 14 - Understanding Construction Accounting and Cost Control for CEMT 34200, while questions on the midterm achieved 73.68% just under the targeted goal of 75%. The average of the three measures was 78.7% which is greater than the target goal of 75%.

Proposed Actions for Course Improvement:

As a result of this assessment, additional instruction will be provided specific to the labor rate calculations and labor burden.


CEMT 35000: Construction Project Cost & Production Control (Charles McIntyre)

The Direct Assessment consists of a homework assignment (end of chapter questions) and a quiz. The table below shows the average grades and percentages for the direct assessments.

<table>
<thead>
<tr>
<th>Direct Assessment</th>
<th>N</th>
<th>Average Grade</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review Questions - Chapter 11</td>
<td>14</td>
<td>18.5/20</td>
<td>92.5</td>
</tr>
<tr>
<td>Quiz - Chapter 11</td>
<td>14</td>
<td>7.2/10</td>
<td>72</td>
</tr>
</tbody>
</table>

Assuming an equal weight for both the review questions and the quiz, a composite percent of 82.25 was achieved for the direct assessment of SLO 15 - Understand Construction Quality Assurance and Control. Assuming an equal weight of both the direct and indirect assessment measures, a total score of 86.1 percent was achieved for SLO 15.

Since this is the initial ACCE accreditation for the CEMT program, it was decided that an overall average of the total grades should be at least 75%. The Indirect Measure (90%), the Direct Measure (82.25%), and a Total Percent of 86.1 indicate that the target value of 75% was met.
Proposed Actions for Course Improvement:

Related specifically to SLO 15 - Understand Construction Quality Assurance and Control, there are a few actions that we plan to incorporate into the class, as outlined below.

Insert a question or two into the Individual Instructor Report specifically related to Quality Management. In addition, questions will be included in the course survey for the other SLOs addressed in this course (SLO 5 - Create a construction project schedules; SLO 12 - Understand different methods of project delivery and the roles and responsibilities of constituencies involved in the design and construction process; SLO 14 - Understand construction accounting and cost control; and SLO 16 - Understand construction project control processes.

We plan to load the rubric for the quality management assignments in Canvas, as well as the rubrics for all other assignments. Some adjustments will probably be made for the rubrics.

We also plan to invite a guest speaker from the construction industry whose role is primarily quality management in a construction company.

Concerning the overall course, we plan to incorporate a more structured approach to the class discussions by developing questions (i.e., talking points which should help stimulate the discussions). After the discussion, each student will submit a summary, or perhaps the “muddiest point” which will assist me in evaluating student understanding and course improvements the next time the course is offered.


CEMT 34100: Construction Scheduling and Project Control (Charles McIntyre)

The Direct Assessment consists of eight (8) homework assignments, as listed below and an entire exam (Exam 3).
- Assignment 5-1: Crashing the Schedule
- Assignment 5-7: Earned Value (Manual Calculations)
- Assignment 5-8: Earned Value in MS Project

The average grades for the eight assignments and the exam are shown below.

<table>
<thead>
<tr>
<th>Direct Assessment Assignments and Exam</th>
<th>N</th>
<th>Average Grade</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignment 5-1 (10 pts)</td>
<td>23</td>
<td>8.2</td>
<td>82</td>
</tr>
<tr>
<td>Assignment 5-7 (10 pts)</td>
<td>23</td>
<td>8.7</td>
<td>87</td>
</tr>
<tr>
<td>Assignment 5-8 (10 pts)</td>
<td>23</td>
<td>9.2</td>
<td>92</td>
</tr>
<tr>
<td>Average Grade of the 3 Assignments</td>
<td>23</td>
<td>8.7</td>
<td>87</td>
</tr>
<tr>
<td>Exam 3 (100 pts)</td>
<td>23</td>
<td>78</td>
<td>78</td>
</tr>
</tbody>
</table>

Assuming an equal weight for the average grade of the assignments (87%) and the exam (78%), a composite percent of 82.5 was achieved for the direct assessment of SLO 16 - Understand Construction Project Control Processes. Assuming an equal weight of both the direct (82.5%) and indirect assessment measures (92.0%) a total score of 87.3% percent was achieved for SLO 16.
Since this is the initial ACCE accreditation for the CEMT program, it was decided that an overall average of the total grades should be at least 75%. The Indirect Measure (92%), the composite Direct Measure (82.5%), and a Total of 87.3% indicate that the target value of 75% was met.

Proposed Actions for Course Improvement:

Related to SLO 16 - Understand Construction Project Control Processes, there are a few actions that I plan to incorporate into the class. The plan is to insert a question or two into the Individual Instructor Report specifically related to Project Control. In addition, questions will be included in the course survey for the other SLOs addressed in this course (SLO 5 - Create a construction project schedule (supporting course) and SLO 10 - Apply electronic-based technology to manage the construction process (supporting course). No major changes are expected for the eight assignments that are used to assess project controls.

An important point to emphasize to the students next semester is the value of completing the course evaluations. I will make an exerted effort to do just that.

17. Understand the Legal Implications of Contract, Common, and Regulatory Law to Manage a Construction Project.

CEMT 34700: Construction Contract Administration & Specifications (Bill White)

The Direct Measures consisted of: 10 questions from the midterm exam (Delivery Systems, General Conditions, and Liens) and 10 questions from the final exam (RFI’s, Reports, Changes, Pay Applications). Below is the summary of the Direct Measures.

<table>
<thead>
<tr>
<th>Direct Measures Calculated Summary</th>
<th>Weighted Average Grade %</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Midterm Exam Questions</td>
<td>85.5</td>
</tr>
<tr>
<td>10 Final Exam Questions</td>
<td>72.3</td>
</tr>
<tr>
<td>Average</td>
<td>78.9</td>
</tr>
</tbody>
</table>

Proposed Actions for Course Improvement:

The topics covered in the midterm exam exceeded the 75% benchmark for this assessment with a weighted average of 85.5%. No corrective action appears warranted. However, the topics covered in the final exam achieved a weighted average of 72.3% which fails to achieve the benchmark. It appears the topics covered in the second half of the semester would benefit from corrective action.

Four questions achieved less than 75% success: #2) construction change directive; #5) RFI, #8) submittal process responsibilities; and #10) RFI. Proposed corrective action will include the following:

1. Develop an in-class RFI exercise that reinforces the nature of the RFI process.
2. Refine the course lecture to clarify and emphasize the distinction between the different change mechanisms: change order, change directive, architect’s supplemental instruction.
3. Refine the course lecture to clarify role responsibilities as assigned by the A201 General Conditions.

CEMT 35000: Construction Project Cost & Production Control (Charles McIntyre)
The Direct Measures consisted of five (5) assignments and five (5) quizzes. The average grades and percentages for the Direct Measures is given in the table below. The Weighted Average Percent for all the Direct Measures was 76.7%

<table>
<thead>
<tr>
<th>Direct Assessment</th>
<th>N</th>
<th>Average Grade</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review Questions - Chapters 3&amp;4</td>
<td>17</td>
<td>8.8 / 10</td>
<td>88</td>
</tr>
<tr>
<td>Review Questions - Chapter 5</td>
<td>17</td>
<td>9.4 / 10</td>
<td>94</td>
</tr>
<tr>
<td>Review Questions - Chapter 7</td>
<td>17</td>
<td>9.5 / 10</td>
<td>95</td>
</tr>
<tr>
<td>Review Questions - Chapter 10</td>
<td>17</td>
<td>9.4 / 10</td>
<td>94</td>
</tr>
<tr>
<td>Review Questions - Chapter 16</td>
<td>17</td>
<td>9.2 / 10</td>
<td>92</td>
</tr>
<tr>
<td>Quiz - Chapters 3&amp;4</td>
<td>17</td>
<td>14.5 / 20</td>
<td>72.5</td>
</tr>
<tr>
<td>Quiz - Chapter 5</td>
<td>17</td>
<td>7.8 / 10</td>
<td>78</td>
</tr>
<tr>
<td>Quiz - Chapter 7</td>
<td>17</td>
<td>6.5 / 10</td>
<td>65</td>
</tr>
<tr>
<td>Quiz - Chapter 10</td>
<td>17</td>
<td>8.0 / 10</td>
<td>80</td>
</tr>
<tr>
<td>Quiz - Chapter 16</td>
<td>17</td>
<td>7.1 / 10</td>
<td>71</td>
</tr>
<tr>
<td>Weighted Average Percent (factoring in Quiz 3&amp;4)</td>
<td></td>
<td></td>
<td>76.7</td>
</tr>
</tbody>
</table>

Since this is the initial ACCE accreditation for the CEMT program, it was decided that an overall average of the total grades should be at least 75%. The Indirect Measure (86%) and the Direct Measure Weighted Average Percent 76.7%) for CEMT 35000 were both greater than 75% indicating that the target value was met.

**Proposed Actions for Course Improvement:**

Based on our definition of SLO 17, the information and student work in CEMT 35000 is rather extensive. No major changes are anticipated concerning SLO 17 in CEMT 35000 except to change some of the review questions (so that they are the same ones every semester) and slightly modify some of the review questions.

For the PowerPoint Presentations associated with Chapters 3, 4, 5, 7, 10, and 16, additional video links will be added to reinforce certain concepts related to SLO 17, such as, litigation and indemnification.

**18. Understand the Basic Principles of Sustainable Construction.**

CEMT 10500: Introduction to Construction Technology (Bill White)

The Direct Measures consisted of: 10 questions from the midterm exam (Delivery Systems, General Conditions, and Liens) and 10 questions from the final exam (RFI’s, Reports, Changes, Pay Applications). Below is the summary of the Direct Measures.

<table>
<thead>
<tr>
<th>Direct Measures Calculated Summary</th>
<th>Weighted Average Grade %</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Midterm Exam Questions</td>
<td>85.5</td>
</tr>
<tr>
<td>10 Final Exam Questions</td>
<td>72.3</td>
</tr>
<tr>
<td>Average</td>
<td>78.9</td>
</tr>
</tbody>
</table>
Proposed Actions for Course Improvement:

As shown in the Direct Measures Calculated Summary CEMT 10500, the results failed to achieve the 75% benchmark by approximately 10%. While a mitigating condition may be that the Fall 2017 semester was the first time this material had been incorporated into the course, this performance clearly indicates the need to modify its presentation within the classroom.

Several different approaches can be pursued to improve these results. All will be considered as this topic may require retooling for presentation in the Fall 2018 semester. Potential revisions include:

1. Lengthening the presentation time. Currently the presentation is limited to 1 week. Depending on the semester schedule, this could occur as two separate lecture periods over two days or one extended period in one day. As the Spring 2018 semester is presented in one extended period, its outcome results will be carefully reviewed to see if this issue persists.

2. Adding an in-class activity to reinforce the subject matter. Additional research is necessary to determine what approach this may take.

3. Adding a homework assignment. While this may be problematic because this module is presented in the last regular week of the semester -- just prior to finals week -- it’s worthy of consideration.

4. Rescheduling the module so that it occurs earlier in the semester. This would offset the problem noted in #3 above and it may receive more serious consideration when incorporated well within the regular semester.

CEMT 35000: Construction Project Cost & Production Control (Charles McIntyre)

For CEMT 35000, the Direct Assessment consists of a homework assignment (end of chapter questions) and a quiz. The table below shows the average grades and percentages for the direct assessments.

<table>
<thead>
<tr>
<th>Direct Assessment</th>
<th>N</th>
<th>Average Grade</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review Questions - Chapter 13</td>
<td>14</td>
<td>18.5 / 20</td>
<td>92.5</td>
</tr>
<tr>
<td>Quiz - Chapter 13</td>
<td>14</td>
<td>15.5 / 20</td>
<td>77.5</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>85.0</td>
<td></td>
</tr>
</tbody>
</table>

Assuming an equal weight for both the review questions (92.5) and the quiz (77.5), a composite percent of 85.0 was achieved for the direct assessment of SLO 18 - Understand the basic principles of sustainable construction for CEMT 35000.

Proposed Actions for Course Improvement:

The Direct Measures for CEMT 35000 met the target benchmark of 75%. No major changes are anticipated for the waste management module. However, as is the case every semester, the review questions for Chapter 13 will change slightly. The quiz questions will also be modified.

Since this class parallels CEMT 44700 - Capstone where student groups must create a waste management plan, the waste management module in 35000 will be delivered the same week as the waste management plan is assigned in capstone.
19. Understand the Basic Principles of Structural Behavior.

CEMT 48400: Wood, Timber & Formwork Design (John Homer)

The Direct Measure for SLO 19 was the Moment & Shear Practice Exercise. There were 17 students in this class. The maximum grade (points) for the Moment & Shear Practice Exercise was 100 points. The table below shows the average grade (based on 100 points) and the percentage (based on 100%).

<table>
<thead>
<tr>
<th>Term</th>
<th>N</th>
<th>Moment/Shear</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2017</td>
<td>17</td>
<td>91</td>
<td>90.6%</td>
</tr>
</tbody>
</table>

Since this is the initial ACCE accreditation for the CEMT program, it was decided that an overall average of the total grades should be at least 75%. The Indirect Measure (88%) and the Direct Measure (90.6%) indicate that the target value was met.

Proposed Actions for Course Improvement:

A continuing challenge in this course is overcoming the presumption that wood is a component of homes and apartments. I feel that we have made a strong case to the students about the many uses and applications of wood and the relevance of learning basic structural concepts such as flexural and shear stress.

While the course grading criteria have been clearly identified in the syllabus until the current semester the automatic interim grade calculation feature of Canvas was not utilized. This semester I structured the individual assignment grading to fit that calculation. The results seem worth the effort. I will refine this in future classes.

As currently structured each student is required to make four presentations to the class and provide a written summary to the instructor. Many of the students have used PowerPoint to focus their presentations. In the future I believe it will be valuable to make these presentation materials available to the students as part of the class file system. I intend to do this starting next semester.

One of the presentations made by each student has been made from summarizing specific videos or materials about the wide use of wood in significant structures. This semester I moved this presentation much earlier in the term as part of the effort to show the relevance wood in many types of construction. I will work to further focus this exercise and hopefully generate some excitement about wood.

20. Understand the Basic Principles of Mechanical, Electrical and Piping Systems.

CEMT 21500: Mechanical and Electrical Systems (John Homer)

The Direct Measure for SLO 20 was the HVAC Recommendation. There were 23 students in this class. The maximum grade (points) for the HVAC Recommendation was 50 points. The table below shows the average grade (based on 50 points) and the percentage (based on 100%).

<table>
<thead>
<tr>
<th>Term</th>
<th>N</th>
<th>HVAC Recommendation</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2017</td>
<td>23</td>
<td>42</td>
<td>84%</td>
</tr>
</tbody>
</table>
Since this is the initial ACCE accreditation for the CEMT program, it was decided that an overall average of the total grades should be at least 75%. The Indirect Measure (88%) and the Direct Measure (84%) indicate that the target value was met.

**Proposed Actions for Course Improvement:**

Prior to the present semester the course grading criteria has been clearly identified in the syllabus but the entry of individual grades in Canvas did not give a clear indication of student standing. This semester I have assigned points to each assignment in proportion to its relevance in the final grade of the course. This effort will be continued and refined so the Canvas calculated course standing is more meaningful.

One particular challenge of a course in mechanical and electrical systems comes from the student’s lack of a context that demonstrates the relevance of the topics to their perception of construction. Most of the students in the class are at sophomore standing and have had at most 1 intern summer and some miscellaneous field experience. Since mechanical and electrical construction are performed by specialty firms and the physical work is outside the normal experience of the students their perception may be that carpentry, concrete, and excavation are the kings of construction activity. In the future I will increase the emphasis on the role of mechanical and electrical construction in the process of building successful projects.

This class would benefit from at least some lab time such as soldering copper and making PEX joints.

A lecture course that meets for 150 minutes, once a week, is a challenge to keep fresh and keep the students engaged. A suggestion from students in the current class is that I incorporate more short videos into the class to provide variety. I intend to do this. Student evaluations indicate that instructor interaction with the students is a weakness. I will continue efforts to more fully engage the students.

For several years I have been using homework worksheets as a means to demonstrate that the students have read the chapters in the text. Other, problem-based homework addresses specific topics with varying degrees of success. I will work on creating new assignments and improving existing assignments to challenge the students.
Course Learning Outcomes

Data for the Course Learning Outcomes is collected every semester and evaluated annually in the form of a Course Assessment Report which is reviewed by the Program Director and the CEMT Curriculum Committee. In addition, Course Learning Outcomes are evaluated by the CEMT IAB during the course reviews. In addition, a comprehensive review of Course Learning Outcomes is conducted during the creation of an ACCE Self-Study report.

First Destination Survey (2016)

<table>
<thead>
<tr>
<th>Post Graduate Plans</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accepted post-graduation employment</td>
<td>100</td>
</tr>
<tr>
<td>Will attend graduate school</td>
<td>0</td>
</tr>
<tr>
<td>Actively seeking employment</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Salary Ranges</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>$30,000 - $39,999</td>
<td>25.00%</td>
</tr>
<tr>
<td>$40,000 - $49,999</td>
<td>25.00%</td>
</tr>
<tr>
<td>$50,000 - $59,999</td>
<td>31.25%</td>
</tr>
<tr>
<td>$60,000 - $69,999</td>
<td>6.25%</td>
</tr>
<tr>
<td>$70,000 - $79,999</td>
<td>12.50%</td>
</tr>
<tr>
<td>Average Salary - $50,135</td>
<td></td>
</tr>
</tbody>
</table>

Complete results of the 2016 First Destination Survey can be found in Volume I: 5.1.7.2 Employment Statistics (pages 49-51). The target was that at least 90% of graduates will be meaningfully employed in the construction industry. In 2016 it was 100%. This was the first year that 100% was reported. The demand for construction management students (full-time and internships) just in the central Indiana area is far greater than the number of CEMT students and graduates.

Trends from 2012 through 2015 indicate fewer students attending graduate school or entering the military on a year by year comparison. The 2017 report has not been generated, but there will be two CEMT students attending graduate school.

The average salaries rose from 2012-2015. However, a drop of $3,000 in average salary was reported in 2016, which is surprising since the demand is at an all-time high.

Graduating Senior Exit Interviews

<table>
<thead>
<tr>
<th>Question</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is your overall satisfaction level with your experience in the CEMT program at IUPUI?</td>
<td>87.4</td>
</tr>
<tr>
<td>How well prepared are you for your career in the construction industry?</td>
<td>90.5</td>
</tr>
</tbody>
</table>

For the written exit interview question, rating of at least 80% was expected and achieved. The IAB reported that 100% of the graduation seniors participated in the exit interviews.

The written component of the Graduating Senior Exit Interviews included other text questions. The surveys will be available to the visiting team during the site visit. The oral interviews conducted and transcribed the CEMT IAB interviewers and are in Appendix C.2 - Transcripts of the Oral Interviews (Senior Exit Interview) of this report.
**Employer Evaluation Survey - CEMT 39000 (Internship)**

Data for the Employer Evaluation Survey is compiled from the following semesters: Summer 2017, Fall 2017, and Spring 2018. The following scale is used by the employers (supervisors) to assess the performance of the interns: 5=Exceptional skill level; 4=Above average skill level; 3=Adequate/average skill level; 2=Limited/minimal skill level; and 1=Skill level lacking. A composite average skill level is reported in the table below.

<table>
<thead>
<tr>
<th>Skill Assessed (n=41)</th>
<th>Skill Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Demonstrates oral communication skills required for the position.</td>
<td>4.5</td>
</tr>
<tr>
<td>2. Demonstrates written communication skills required for the position.</td>
<td>4.0</td>
</tr>
<tr>
<td>3. Analyzes situations and takes appropriate action.</td>
<td>3.9</td>
</tr>
<tr>
<td>4. Resolves problems in a timely manner.</td>
<td>4.2</td>
</tr>
<tr>
<td>5. Has the technical skills required for the position.</td>
<td>4.1</td>
</tr>
<tr>
<td>6. Has the ability and is willing to learn new technical skills and enhance existing skills.</td>
<td>4.6</td>
</tr>
<tr>
<td>7. Makes positive impact on work team by establishing rapport and credibility.</td>
<td>4.3</td>
</tr>
<tr>
<td>8. Assumes appropriate leadership roles.</td>
<td>3.7</td>
</tr>
<tr>
<td>9. Produces high quality work.</td>
<td>4.2</td>
</tr>
<tr>
<td>10. Uses good judgement and establishes priorities.</td>
<td>4.4</td>
</tr>
<tr>
<td>11. Practices ethical behavior.</td>
<td>4.7</td>
</tr>
<tr>
<td>12. Takes initiative to get a job done including overcoming obstacles.</td>
<td>3.9</td>
</tr>
<tr>
<td>13. Sets and communicates appropriate goals and follows-up with results.</td>
<td>3.8</td>
</tr>
</tbody>
</table>

**How would you assess the intern’s overall performance? (n=41)**

<table>
<thead>
<tr>
<th>Rating</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Outstanding</td>
<td>21%</td>
</tr>
<tr>
<td>Above Average</td>
<td>63%</td>
</tr>
<tr>
<td>Satisfactory</td>
<td>12%</td>
</tr>
<tr>
<td>Below Average</td>
<td>4%</td>
</tr>
<tr>
<td>Unsatisfactory</td>
<td>0%</td>
</tr>
</tbody>
</table>

In the survey there is a section for “other comments” that are available for the visiting team during the site visit. The target performance criteria is that 80% of the interns should receive an Outstanding or Above Average performance rating. The actual performance rating was 84% which indicates that this benchmark was met.

**Student Evaluation Survey - CEMT 39000 (Internship)**

Data for the Student Evaluation Survey is compiled from the following semesters: Summer 2017, Fall 2017, and Spring 2018. The following scale is used by the students (interns) to assess various aspects of the internship experience: 5 = Strongly Agree; 4 = Agree; 3 = Somewhat Agree; 2 = Disagree 1 = Strongly Disagree. A composite average skill level is reported in the table below.

<table>
<thead>
<tr>
<th>Respond to the Following Comments (n=41)</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. My level of responsibility was appropriate and engaging.</td>
<td>4.3</td>
</tr>
<tr>
<td>2. This experience helped focus my career direction and goals.</td>
<td>4.7</td>
</tr>
<tr>
<td>3. I increased my knowledge and developed realistic expectations of the world of work.</td>
<td>4.9</td>
</tr>
<tr>
<td>4. I contributed as a member of the team.</td>
<td>4.8</td>
</tr>
<tr>
<td>5. They provided good orientation and training.</td>
<td>4.1</td>
</tr>
</tbody>
</table>
In the survey there is a section for “other comments” that are available for the visiting team during the site visit. The target performance criteria was 80% of the interns should Strongly Agree or Agree that the internship experience was positive. The actual performance rating was 4.7 which translates to 94% which indicates that this benchmark was met.

**CEMT IAB Course Reviews**

During the 2017 spring and fall semesters many CEMT courses were selected for a review by a CEMT IAB member. The review included a meeting with the course instructor to discuss the syllabus, textbook, course materials, topical outline, and class/lab presentation materials. This process included a classroom/lab visit and a written report. The course instructor, in conjunction with the CEMT IAB reviewer, selected a mutually convenient time to visit the class. The CEMT IAB Course Review Reports were compiled by the reviewer and shared with the course instructor and Program Director. The reports consisted of the following sections:

- CEMT IAB Course Review Report
- Course: (Number and Title)
- Instructor: (Name)
- IAB Reviewer: (Name)
- General Comments and Observations
- Suggestions for Course Improvement

For a variety of reasons, not all courses that were on the schedule to be reviewed were reviewed. Several of the Course Review Reports were considered superficial, at best. The CEMT IAB, in conjunction with the Program Director, has developed a “new” course review process and procedures which will be implemented during the 2018 fall semester. Basically, a more rigorous approach to course review. It is anticipated that this updated approach will provide meaning results to the course instructors.

Samples of CEMT IAB Course Review Reports are present in Appendix C.
CENT Alumni Survey

How well have you developed and maintained a sustained program of continuing education and life-long learning?

Answered: 13  Slipped: 0

Very Well

Good

Adequate

Fair

Poor

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Q2

How well do you practice effective written and oral communication to successfully participate within an interdisciplinary team environment?

Answered: 13  Slipped: 0
How well can you demonstrate an ability to apply problem-solving skills and integrate technical knowledge?

Answered: 3

<table>
<thead>
<tr>
<th>RESPONSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Well</td>
</tr>
<tr>
<td>Good</td>
</tr>
<tr>
<td>Adequate</td>
</tr>
<tr>
<td>Poor</td>
</tr>
<tr>
<td>TOTAT</td>
</tr>
</tbody>
</table>

Comments (0)
Q4

How well have you become an engaged construction professional who comprehends the ethical, social, environmental, and economic impacts of construction decisions and solutions?

Answered: 13  Slipped: 0

Very Well: 61.54%
Good: 15.38%
Adequate: 23.08%
Fair: 0.00%
Poor: 0.00%
Comments: 0.00%

Q5

How well have you become an engaged citizen who seeks service and leadership roles in professional societies and organizations, as well as in your community?

Answered: 13  Slipped: 0
Appendix C.2 - Transcripts of the Oral Interviews  
(Senior Exit Interviews)

April 27, 2018

To: IUPUI CEMT Staff  
From: Allen Galloway, IAB Chair  
Re: Senior Exit Interview Questions Answers/Comments for 
    Class of (May) 2018

Positives:

- Students liked the “hands on type of instruction” of the program.
- Students liked being involved with projects.
- Students enjoyed classes and class content.
- Students appreciated instructors with industry experience.
- Students like the internship requirement.
- Students like the availability of different industry software programs.
- Students like SSC.
- Students like that they could get to know the staff and instructors.
- Students liked that instructors would go beyond class time to help students learn and understand concepts being taught in class.
- Students liked the classes.
- Students liked that class times are after 4-5 pm.
- Senior Capstone Class was great.

Student Debt Survey of 12 Students in Group Interviewed:

- $7,000
- $22,000
- $30,000
- 0
- $27,000
- 0
- $30,000
- $10,000
- 0
- $3,000
- 0
- $5,000
- **Average Student Debt of $11,167. Definitely below national average.**

Negatives:

- Wood and Timber should have less math and engineering and more “hands on” working with actual wood and timber building systems.
Concrete class: More “hands on” working with different concrete systems instead of calculations and engineering.

In “Soils Class” the instructor should teach students how to read a soils report instead of learning methods of putting together a soils test.

Students want more class time learning how to read and interpret geotech reports.

Students want to learn more about building techniques to minimize labor requirements.

Students want to learn important aspects of the building code.

Students think there is too much emphasis on math and engineering instead of management concepts and methods.

Big discussion of quality of advising services offered to students. They said that advisors came and went frequently. Advisors did not know class requirements. Advisors gave wrong advice and students had to take another class to meet requirement instead of the class that was advised to take. Students said that advisors need to be on the same page as the program offered and what is required to complete program in a timely and efficient manner.

Instructors that have one class seemed like their grading was slow and they had very limited office hours. Several students complained about this.

Need more classes/instruction on what happens after bid award. Maybe a building sequencing class. What happens during construction class?

Many students complained that there was too much engineering.

Students said that second surveying class was not necessary. (I told them I did not know if this was required by ACCE or not.) Maybe look at having one surveying class.

Students said to copy/mimic Purdue West Lafayette Strength/Materials class.

Students said that surveying equipment is “so outdated”. Equipment is from several technological generations ago.

April 27, 2018

To: IUPUI CEMT Staff  
From: Len Birnbaum  
Re: Senior Exit Interview Questions Answers/Comments for  
Class of (May) 2018  

Positives:

- Students liked that the curriculum was a good mix of engineering and management courses.
- Students liked the Career Fair and placement services offered.
- Students thought that the curriculum was generally a good representation of all aspects of the construction industry (i.e. engineering, surveying, CM, etc.).
- Students mentioned specifically the estimating course and that it was great!
- Students like the internship requirement, but thought it should be offered even earlier.
- Students like the online course offerings.
- Students liked the field/hands on experiences, but still thought that there could be more!
- Students liked that class offerings in the evenings and thought that mostly the courses were offered with enough frequency.
- Commented that both Charlie and Matt were great instructors (and counselors).
Student Survey of impression of the curriculum shift from more Engineering/design to more CM/business: Exactly half liked the new way better and half the old way = 6 votes to 6.

Negatives:

- Students felt like MEP215 needed a lab.
- Students want the safety class to earn them at least a 10 hour OSHA, but a 30 hour preferred.
- In the 330 class, the students felt that the professor was a VERY POOR communicator.
- Students want even more field experience and felt that it should be put into the curriculum earlier.
- Students felt the software for many of the classes were behind the times (specifically mentioned Primavera vs Procore).
- International students complained majorly about the internships as it related to their access to jobs. The whole process/system of getting them with a US company was very frustrating!
- Exactly half of the students thought that there is too much emphasis on math and engineering vs. management concepts and methods – the other half, just the opposite.
- Some students would like to see a LEED Green Assoc. certificate offered.
- Students commented that the CPM class needed the experience of “scheduling an actual job.” I was surprised that this had been dropped from the course because it used to be included!
- Big discussion of quality of advising services offered to students. They said that advisors were too few and had too much turnover. Advisors did not know class requirements. Advisors gave wrong advice and students had to take another class to meet requirement instead of the class that was advised to take. Students said that advisors need to be on the same page as the program offered and what is required to complete program in a timely and efficient manner.
- There were many complaints about the Adjunct Instructors. Students thought that they were not prepared well enough on Canvas. Also that their grading was slow and they had very limited office hours. Several students complained about their lack of teaching experience in general and that there was too much turnover among them.
- Students felt that the Construction Econ class needed a lab for learning the EXCEL portion of the course. Not having that made it difficult to evaluate how they really did in the class and what they really learned.
- Students said that second surveying class was really bad, but that had much to do with the professor being poor more than the class being poor. Software support for the class was also lacking.
- Students said much of the materials testing and surveying equipment is “so outdated”. Equipment is from several technological generations.
Appendix C.3

CEMT IAB Course Reviews
CEMT IAB Course Review

Course: CEMT 10500 – Introduction to Construction Technology

Instructor: Bill White

IAB Reviewer: Becky Henderson

After a review of the course materials (syllabus, textbook, power points, exams, assignments, etc.), please provide your typewritten responses in the space provided below. Detailed and thoughtful responses are most appreciated.

General Comments and Observations:

Course covers introductions to various roles, various industries, blue print reading, REVIT, Navisworks, components of construction (footings, framing, fascia, structural, HVAC and Plumbing) and ethics. Course assignments, readings, in class components, quizzes and exams all reinforce understanding of the syllabus topics.

In class components use group work which develops team building early in the study program. Instructor feedback is immediate during in class components – lab work and quizzes.

Text: Understanding Construction Drawings, Mark W. Huth 6th Edition. This text includes partial drawing sets for four different structures, enabling: scale work, familiarization with typical drawing layout, potential for errors, etc. Chapters are very short and reading assignments are minimal.

Course work outside of class/lab appears to be minimal. Students appear to be attempting to complete all the work inside the classroom/lab time except for the limited reading (and some of that is taking place just prior to class). Although that may be possible, it limits the opportunity for learning. Further, there is a tendency by some students during group work and in labs to allow others to complete their work for them. Although these actions complete the assignment their individual opportunity for learning is minimized. Struggling is ok, as is asking for help/clarification as long as you are improving your knowledge. That is the goal, not just completing the assignment. Students need to ask themselves “what did I accomplish/learn today?”

Suggestions for Course Improvement:

We have worked so hard to facilitate group dynamics, but we also need to address individual student engagement in the learning process at this introductory level. One way to accomplish this and also develop written communication skills may be to require a several page paper on a role, industry, material or technology. Example: Drawings - what are the various systems, best suited for what applications, strengths and weaknesses, my own experience?
CEMT IAB Course Review

Course: CEMT 34200: Construction Cost and Bidding

Instructor: Matt Ray

IAB Reviewer: Andy Lock

After a review of the course materials (syllabus, textbook, power points, exams, assignments, etc.), please provide your typewritten responses in the space provided below. Detailed and thoughtful responses are most appreciated.

General Comments and Observations:

Materials are relevant and thorough.
Students were very engaged in the lecture and asked good questions.

Suggestions for Course Improvement:

Consider exposure to and some usage of, or incorporation of more technology such as:
- On-screen take-off
- Revit
- Earthwork take-off software, Agg Tek, Site Works,
- Database estimating software – Timberline, Win Est, etc.

Along with Excel this is the standard “toolbox” in the industry today. Proficiency with this software allows graduates to be able to begin adding on their first day as they begin a new career.

Consider putting more emphasis on simple / quick ways to check and double check work. Although the technology available today can save tremendous amounts of time, the key to using it is knowing how to confirm the results are correct. Estimating mistakes are preventable and can be very costly.

This class could build on previous exposure to estimating software in the CEMT 28000 Quantity Survey course.