Section 1 – Program Mission

The mission of the Bachelor of Science in Civil Engineering (BSCE) program at Oregon Institute of Technology is to prepare students for professional practice. To be prepared to practice as professionals, engineers must be able to act responsibly and ethically, understand their limits and the limits of the tools they use, communicate effectively, work well in teams, and, amid the changing landscape of the field of civil engineering, be able to pursue graduate level education.

The mission, objectives, and student learning outcomes for the BSCE program are reviewed annually by the department at the fall retreat during convocation. They are also reviewed annually by the department's Industrial Advisory Council (IAC).

Section 2 – Program Description and History

Program History

The Bachelor of Science in Civil Engineering (BSCE) program at Oregon Institute of Technology (Oregon Tech) was first accredited by the Engineering Accreditation Commission (EAC) of ABET in 1998. A number of curricular and process changes followed that initial visit, the most significant of which was the implementation of an interdisciplinary senior design capstone project. The program received continued accreditation after visits from ABET in 2004, 2010, and 2016. A major program revision was implemented fall 2013 that aligned the BSCE with the outcomes outlined in the ASCE Body of Knowledge.

Program Locations

The BSCE is offered exclusively on the Klamath Falls campus. No program courses are taught online.

Program Enrollment

Fall 2020 – 112
Fall 2019 – 114
Fall 2018 – 124
Fall 2017 – 116
Fall 2016 – 117
Fall 2015 – 120

Program Graduates

2021 – 25
2020 – 29
2019 – 23
2018 – 23
2017 – 25
2016 – 25
2015 – 15

Employment Rates and Salaries

Due to the pandemic and changing of assessment coordinator roles, graduate surveys were not conducted. These surveys will recommence in Spring, 2020. Anecdotal evidence suggests that employment rates are still very high and starting salaries range from $50,000 - $70,000.

Industry Relationships
The department maintains relationships with industry primarily through its industrial advisory committee (IAC) and student chapters of various professional societies and associations including the American Society of Civil Engineers (ASCE), Associated General Contractors (AGC), Institute of Transportation Engineers (ITE), and Engineers Without Borders (EWB). Individual faculty connections with private firms and public agencies are strong. These connections support our senior design project with professional clients and project advisors as well as integration of recent innovations in practice.

Showcase Learning Experiences
As a result of the COVID-19 pandemic, all the 2020-21 classes were held online, either synchronously or asynchronously. The faculty in the Civil Engineering Department were able to quickly pivot and develop and deliver quality online courses. Small-group, in-person laboratory experiences in each of the civil engineering sub disciplines (structural, geotechnical, transportation, and water resources engineering) occurred during this academic year.

Student chapter events like the ITE Traffic Bowl, ASCE Student Conference concrete canoe and American Institute of Steel Construction (AISC) steel bridge competitions. The student chapters attended online leadership conferences and competitions.

The senior design project (CE401/402) is the capstone experience for civil engineering students in which they develop designs for local and regional civil engineering projects. They work with clients that include municipal and state agency representatives and professional practitioners.

The civil engineering laboratories continue to be updated following the 2018-2019 completion Phase 1 of the renovation of Cornett Hall. All laboratory spaces were carefully programmed to ensure adequate space (square footage) and resources (power, water, compressed air, ventilation, computer workstations, and furniture) to serve the program well into the future. These spaces now rival other high-quality undergraduate teaching laboratories available on the west coast.

Supportive Student Comments
Due to the pandemic and changing of assessment coordinator roles, graduate surveys were not conducted. These surveys will recommence in Spring, 2020.

Section 3 – Program Student Learning Outcomes (PLSOs)

Upon graduating from the BSCE program at Oregon Tech, students should possess:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

These outcomes stem from the program mission and objectives. They are identical to the outcomes published by the Engineering Accreditation Commission of ABET. These outcomes were decided upon during the department retreat in the fall of 2018. The outcomes were reviewed and approved by the Industrial Advisory Council also in the fall of 2018.

Section 4 – Curriculum Map

Outcome mapping for outcomes 1-7 is included here (Table 4-1 through 4-5). Upon review of these tables it is clear that, in general, most outcomes are introduced in general education and foundational coursework and reinforced throughout civil engineering core courses and electives. The alignment of program outcomes (PSLOs) and institutional outcomes (ESLOs) is provided in Table 4-1. Rubrics developed for the PSLOs draw as much as possible on the rubrics for the institutional outcomes in order to streamline assessment activities.

Table 4-1. Mapping of program and institutional outcomes

	ESLO 1 – Commun -ication	**ESLO 2 - Inquiry & Analysis**	**ELSO 3 - Ethical Reasoning**	**ESLO 4 - Quantitative Literacy**	**ESLO 5 - Teamwork**	**ESLO 6 - Diverse Perspectives**
PSLO 1 - Problem Solving						
PSLO 2 - Design						
PSLO 3 - Communication						
PSLO 4 - Ethical/Professional Responsibility						
PSLO 5 - Teamwork						
PSLO 6 - Experimentation						
PSLO 7 - New Knowledge						

Tables 4-2 through 4-6 map the PLSOs and ESLOs to courses throughout the curriculum. Courses are identified as including introduction (I), reinforcement (R), or mastery (M) of the listed

Table 4-2. Mapping of Program Outcomes to Fundamentals and Core Engineering Courses

	Program Outcomes							Institutional Outcomes					
Fundamentals and Core Engineering Courses	PSLO 1 Problem Solving	PSLO 2 Design	PSLO 3 Communication	PSLO 4 Ethics	PSLO 5 Teamwork	PSLO 6 Experimentation	PSLO 7 New Knowledge	ESLO 1 Communication	ESLO 2 Inquiry & Analysis	ELSO 3 Ethical Reasoning	ESLO 4 Quantitative Literacy	ESLO 5 Teamwork	ESLO 6 Diverse Perspectives
ENGR101 - Introduction to Engineering I	I	I	I	I		I	I	I	I	I	I		I
ENGR102 - Introduction to Engineering II			I		I	I		I	I			I	
ENGR211 - Engineering Mechanics: Statics	I								I		I		
ENGR213 - Engineering Mechanics: Strength of Materials	R	I	I			I	I	I	I		R		
ENGR318 - Fluid Mechanics	R					R			R		R		
CE203 - Engineering Graphics			I				I	I	I				
CE205 - Computational Methods	I										I		
CE212 - Civil Engineering Materials	R					R			R		R		
GIS 134 Geographic Information Systems			I					I					
GME 161 Plane Surveying I	I								I		I		

Table 4-3. Mapping of Program and Institutional Outcomes to Civil Engineering Core Courses

	Program Outcomes							Institutional Outcomes					
Fundamentals and Core Courses	PSLO 1 Problem Solving	PSLO 2 Design	PSLO 3 Communication	PSLO 4 Ethics	PSLO 5 Teamwork	PSLO 6 Experimentation	PSLO 7 New Knowledge	ESLO 1 Communication	ESLO 2 Inquiry & Analysis	ELSO 3 Ethical Reasoning	ESLO 4 Quantitative Literacy	ESLO 5 Teamwork	ESLO 6 Diverse Perspectives
CE308 - Principles of Professional Practice		I	R	R	I		I	R	R	R		R	R
CE311 - Introduction to Geotechnical Engineering	R	I				R	R						
CE312 - Earth Pressures and Foundations	R	R											
CE331 - Structural Analysis	R										R		
CE341 - Elementary Structural Design		R					R				R		
CE351 - Introduction to Transportation Engineering	R	R		R									
CE354 - Traffic Engineering	R	M		R			R						
CE371 - Closed Conduit Design	R	M										R	
CE374 - Hydrology	R	M					R					R	
CE442 - Advanced Reinforced Concrete Design	R	M									R		
CE444 - Intermediate Steel Design	R	M									R		
CE401 - Civil Engineering Project I	R	R	R	R	R		R	R	R	R	R	R	R
CE402 - Civil Engineering Project II	M	M	M	M	M		M	M	M	M	M	M	M
CE405 - Sustainability and Infrastructure	M	R	R	M	R			R	R	M		R	M

Table 4-4. Mapping of Program and Institutional Outcomes to Civil Engineering Elective Courses

	Program Outcomes							Institutional Outcomes					
Fundamentals and Core Courses	PSLO 1 Problem Solving	PSLO 2 Design	PSLO 3 Communication	PSLO 4 Ethics	PSLO 5 Teamwork	PSLO 6 Experimentation	PSLO 7 New Knowledge	ESLO 1 Communication	ESLO 2 Inquiry & Analysis	ELSO 3 Ethical Reasoning	ESLO 4 Quantitative Literacy	ESLO 5 Teamwork	ESLO 6 Diverse Perspectives
CE407 – Advanced Soil Mechanics	M	R							R		R		
CE407 – GIS for Water Resources	M						R		R		R		
CE407 – Hydraulic & Hydrological Modeling	M						R		R		R		
CE407 – Seismic Engineering	M	R							R		R		
CE407 – Traffic Impact Analysis	M	R							R		R		
CE413 – Advanced Soils	M	R							R		R		
CE421 – Seepage and Earth Structures	M	R							R		R		
CE 422 - Adv Shear Strength of Soils	M	R							R		R		
CE 423 - Deep Foundations	M	R							R		R		
CE 432 - Structural Loading & Lateral Forces	M	M					R						
CE 433 - Structural Matrix Analysis	M								R		R		
CE 439 - Highway Bridge Rating													
CE 447 - Masonry Design		R											
CE 448 - Timber Design		R											
CE 449 - Bridge Design	M	R					R		R		R		
CE 450 - Transportation Structures	M	R					R		R		R		
CE 456 - Pavement Engineering	M	M							R		R		
CE 457 - Transportation & Land Development	M								R		R		
CE 458 - Transportation Safety	M								R		R		
CE 468 - Travel Demand Modeling	M								R		R		
CE 473 - Groundwater	M										R		
CE 476 - Applied Hydraulic Design	M	M					R		R		R		
CE 481 - Environmental Engineering I	M										R		
CE 489 - Treatment Wetlands	M	R					R		R		R		

Table 4-5. Mapping of Program and Institutional Outcomes to Math and Science Courses

	Program Outcomes							Institutional Outcomes					
Math and Science Courses	PSLO 1 Problem Solving	PSLO 2 Design	PSLO 3 Communication	PSLO 4 Ethics	PSLO 5 Teamwork	PSLO 6 Experimentation	PSLO 7 New Knowledge	ESLO 1 Communication	ESLO 2 Inquiry & Analysis	ELSO 3 Ethical Reasoning	ESLO 4 Quantitative Literacy	ESLO 5 Teamwork	ESLO 6 Diverse Perspectives
CHE 221/222 General Chemistry	I					I	I		I		I		
GEOL 201 Physical Geology	I										I		
PHY 221/222 General Physics with Calculus	I					I	I		I		I		
MATH 251 Differential Calculus	I										I		
MATH 252 Integral Calculus	R										R		
MATH 254N Vector Calculus I	R										R		
MATH 321 Applied Differential Equations I	R										R		
MATH 361 Statistical Methods	R										R		

Table 4-6. Mapping of Program and Institutional Outcomes to Communication, Humanities, and Social Science Courses

	Program Outcomes							Institutional Outcomes					
Communication, Humanities, and Social Sciences Courses	PSLO 1 Problem Solving	PSLO 2 Design	PSLO 3 Communication	PSLO 4 Ethics	PSLO 5 Teamwork	PSLO 6 Experimentation	PSLO 7 New Knowledge	ESLO 1 Communication	ESLO 2 Inquiry & Analysis	ELSO 3 Ethical Reasoning	ESLO 4 Quantitative Literacy	ESLO 5 Teamwork	ESLO 6 Diverse Perspectives
SPE 111 Public Speaking			I					I					
SPE 321 Small Group and Team Communication					I							I	
WRI 121/122 English Composition			I/R				I	I/R					
WRI 227 Technical Report Writing			R				R	R					
COM 401 Civil Engineering Project I	R		R		R		R	R				R	
Humanities Electives				I					I				
Social Science Electives			I/R						I				
ANTH 452 Globalization			R					R	R				

Section 5 – Assessment Cycle

The Civil Engineering Department follows a three-year assessment cycle during which the faculty members conduct numerous assessments to ensure the quality of the program. The 2020-2021 academic year was the final year in the current cycle.

During the 2018 fall retreat, the civil engineering department developed a plan for targeted assessments of the newly adopted Outcomes 1-7. This plan called for a cycle in which each outcome is directly assessed at least twice in specific, targeted courses in the curriculum: courses where the outcome is normally taught, reinforced, or otherwise addressed.

This cycle was a work in progress and was constantly evolving. The department faculty met at the beginning of each term to discuss outcomes that were scheduled to be assessed during that term. Performance criteria for each outcome were either developed, or if they had been used previously, reviewed. After deciding on appropriate performance criteria, the faculty members discussed whether the targeted course was still an appropriate course in which to conduct the assessment or decided upon a new setting. Sometimes the newly targeted course was during the same term and sometimes it was in a different term and so the outcome was moved to a new time in the cycle. As such, the assessment cycle may have been slightly changed from year to year. Table 5-1 summarizes the most up-to-date cycle as well as the courses that have been targeted for assessments.

Table 5-1. Assessment Cycle with Targeted Courses

	2018-2019			2019-2020			2020-2021		
Outcome	**Fall**	**Winter**	**Spring**	**Fall**	**Winter**	**Spring**	**Fall**	**Winter**	**Spring**
1. Problem Solving				CE 432				CE 371	
2. Design					CE 402 CE 371				
3. Written Communication	CE 401				CE 402				
4. Oral Communication	CE 401			CE 401					
4. Professionalism	CE 401				CE 318				
5. Teamwork					CE 402			CE 402	
6. Experimentation	CE 401					ENGR 213	ENGR 318		
7. New Knowledge	CE 401						CE 401		

Section 6 – Assessment Activity

As shown in Table 5-1, four targeted assessments were conducted in the 2020-21 academic year. Each of the assessments are detailed below.

Outcome 1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

The second assessment of Outcome 1 took place during the winter term in CE 371-Closed Conduit Design. Twenty-five students were asked to design a water distribution system for a neighborhood in Klamath Falls. In one student's words:

> As a method of learning to apply knowledge gained from the closed conduit class at Oregon Tech, this project, which was to create a water distribution system for a community within Klamath Falls was completed. The primary purpose of this project was to design the entire system according to the Klamath Falls Public Works Engineering Standards. Other than learning how to design this network, this project also served as an opportunity to become more familiar with EPAnet, which is software commonly used in industry to build water distribution systems. Upon completion, this design will provide the details necessary to construct a water distribution system from Pelican Street to W Oregon Ave and from approximately Berkeley St. to Sari Drive in

Klamath Falls, OR. This area services 67 residential units, each of which is assumed to contain one household. The requirements of this system were for it to include one reservoir, one pump, and one tank. All velocities and pressures follow Public Works Engineering Standards and were analyzed over a 72-hour period to ensure they could meet peak and fire demands.

Each of the students submitted an individual design report. These reports were evaluated by the course instructor according to the departments design rubric (see Figure 6-1). Students performed extremely well when determining network layouts, pipe properties, and pump characteristics required to maintain a suitable water distribution network. With little guidance, a variety of different network designs were developed. Benchmarks were met, no further action required at this time. The results of this assessment are summarized in Table 6-1.

Table 6-1. Summary of Second Assessment of Outcome 1.

Performance Criteria	Assessment Methods	Measurement Scale	Minimum Acceptable Performance	Results
Identify a complex engineering problem	Evaluation of water distribution system design project using rubric	1 to 4 according to rubric	75% scoring 3 or higher	100% ≥ 3 88% = 4
Formulate a complex engineering problem				100% ≥ 3 40% = 4
Solve a complex engineering problem				100% ≥ 3 68% = 4
Apply principles of engineering, science, and mathematics				100% = 4

Performance: Criteria	High Proficiency (4) The work meets listed requirements for this criterion; little to no development needed.	Proficiency (3) The work meets most requirements; minor development would improve the work.	Some Proficiency (2) The work needs moderate development in multiple requirements.	Limited Proficiency (1) The work does not meet this criterion: it needs substantial development in most requirements.
Identify a complex engineering problem	Identifies a creative, focused, and manageable problem that addresses potentially significant yet previously less-explored aspects of the subject.	Identifies a focused and manageable problem that appropriately addresses relevant aspects of the subject.	Identifies a problem that, while manageable, is too narrowly focused and leaves out relevant aspects of the subject.	Identifies a problem that is too general and wide-ranging to be manageable.
Formulate a complex engineering problem	All elements of the methodology or theoretical framework are skillfully developed.	Critical elements of the methodology of theoretical framework are appropriately developed. However, more subtle elements are ignored.	Critical elements of the methodology of theoretical framework are missing, incorrectly developed, or unfocused.	Inquiry design demonstrates a misunderstanding of the methodology or theoretical framework.
Solve a complex engineering problem	Solve idenified problem(s) with chosen methodology, with little to no instructor prompting, or guidance. Acknowledge and justify assumptions used in solving problem(s).	Solve idenified problem(s) with correct equation(s), in response to broad instructor prompting. Acknowledge and justify assumptions used in solving problem(s).	Solve idenified problem(s) with correct equation(s), closely following instructors previous solved examples, but in a slightly differring context.	Solve problems using formulas or frameworks provided directly from instructor for the specific solution(s) of this/these specific probem(s).
Apply principles of engineering, science, and mathematics	Correctly perform challenging computations and sequences of computations, knowing the tools needed.	Correctly perform longer and more complicated computations, or sequences of linked computations selecting from a list of possible tools.	Correctly perform longer and more complicated computations, or sequences of linked computations with tools provided.	Perform fairly short single computations with tools provided.

Figure 6-1. Problem Solving Rubric.

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

The second assessment of Outcome 5 took place during winter term in CE 402-Civil Engineering Project II. Thirty-one students divided into six groups. They were asked to evaluate themselves and their group members using the evaluation instrument shown in Figure 6-2.

CE 401/402 Civil Engineering Design Project Peer and Self Assessment	Self	Student B	Student C	Student D	Write the first and last names of the people on your team including your own name. This self and peer evaluation asks about how you and each of your teammates contributed to the team during the time period you are evaluating. Please read each item that describes a way of contributing. Then confidentially rate yourself and your teammates using the following scale: 0 Not applicable or not enough information; 1 Strongly Disagree; 2 Disagree; 3 Neither Agree Nor Disagree; 4 Agree; 5 Strongly Agree
Contributing to the Team's Work					Did a fair share of the team's work.
					Fulfilled responsibilities to the team.
					Completed work in a timely manner.
					Came to team meetings prepared.
					Did work that was complete and accurate.
					Made important contributions to the team's final product.
					Kept trying when faced with difficult situations.
					Offered to help teammates when it was appropriate.
					←Provide supporting comments per member for this category in these cells
Interacting with Teammates					Communicated effectively.
					Facilitated effective communication in the team.
					Exchanged information with teammates in a timely manner.
					Provided encouragement to other team members.
					Expressed enthusiasm about working as a team.
					Heard what teammates had to say about issues that affected the team.
					Got team input on important matters before going ahead.
					Accepted feedback about strengths and weaknesses from teammates.
					Used teammates' feedback to improve performance.
					Let other team members help when it was necessary.
					←Provide supporting comments per member for this category in these cells
Keeping the Team on Track					Stayed aware of fellow team members' progress
					Assessed whether the team was making progress as expected.
					Stayed aware of external factors that influenced team performance.
					Provided constructive feedback to others on the team.
					Motivated others on the team to do their best.
					Made sure that everyone on the team understood important information.
					Helped the team to plan and organize its work.
					←Provide supporting comments per member for this category in these cells
Expecting Quality					Expected the team to succeed.
					Believed that the team could produce high-quality work.
					Believed that the team should achieve high standards.
					Cared that the team produced high-quality work.
					←Provide supporting comments per member for this category in these cells
Having Relevant Knowledge, Skills, and Abilities					Had the skills and expertise to do excellent work.
					Had the skills and abilities that were necessary to do a good job.
					Had enough knowledge of teammates' jobs to be able to fill in if necessary.
					Knew how to do the jobs of other team members.
					←Provide supporting comments per member for this category in these cells

Figure 6-2. Self- and Peer-Evaluation Instrument.

The students' evaluations were assessed by a faculty member using the rubric shown in Figure 6-3. The results of this assessment are summarized in Table 6-2. As can been seen in the summary, all benchmarks were met for this assessment and no further action was required.

Performance: Criteria	High Proficiency (4) The work meets listed requirements for this criterion; little to no development needed.	Proficiency (3) The work meets most requirements; minor development would improve the work.	Some Proficiency (2) The work needs moderate development in multiple requirements.	Limited Proficiency (1) The work does not meet this criterion: it needs substantial development in most requirements.
Provide leadership to Establish Goals and Plan Tasks	Assumes a leadership role, establishes clear goals with input from all members and plans specific tasks to meet those goals.	Displays evidence of a) strong support for those in leadership and b) establishing clear goals with input from all members and planning specific tasks to meet those goals.	Provides little leadership or support for leadership in establishing goals and planning tasks	Does not contribute at all toward establishing goals or planning tasks
Collaborates Effectively	Contributes significantly to discussions, decision making and work.	Often contributes to discussions, decision-making and work.	Contributes something to discussions, decision making and work.	Dominates discussions, decision making, and work; or may not contribute at all.
Interacts Appropriately to Create an Inclusive Environment	Always communicates openly and respectfully, including all members equally.	Usually communicates openly and respectfully, including all members equally.	May not consistently communicate openly and respectfully. May not be including some members or disregarding their thoughts or opinions	Does not communicate with team and disregards others thoughts and opinions.
Assumes Roles & Responsibilities to Meet Objectives	Always completes assignments on time.	Often completes assignments on time.	Some assignments are not completed on time.	Never completes assignments on time.
Develops Strategies for Effective Action	Always uses effective decision making processes to decide on action.	Usually uses effective decision making processes to decide on action.	Sometimes uses decision making processes to decide on action.	Seldom uses decision making processes to decide on action. Often makes decisions for the group.
Reconciles Differences	Welcomes disagreement and uses differences to improve decisions.	Often welcomes disagreement, uses differences to improve decisions.	Sometimes welcomes disagreement.	Does not welcome disagreement.

Figure 6-3. Teamwork Rubric.

Table 6-2. Summary of Second Assessment of Outcome 5.

Performance Criteria	Assessment Methods	Measurement Scale	Minimum Acceptable Performance	Results
Provide leadership to Establish Goals and Plan Tasks	Peer and self assessment, faculty review of individual and team performance	1 to 4 according to rubric	75% scoring 3 or higher	90% ≥ 3 45% = 4
Collaborates Effectively				81% ≥ 3 42% = 4
Interacts Appropriately to Create an Inclusive Environment				94% ≥ 3 55% = 4
Assumes Roles & Responsibilities to Meet Objectives				90% ≥ 3 58% = 4
Develops Strategies for Effective Action				90% ≥ 3 52% = 4

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

The second assessment of Outcome 6 took place during fall term in ENGR 318-Engineering Mechanics: Fluids. Thirty-five students divided into ten groups as asked to develop an experiment to demonstrate their knowledge of fluid flow through a Venturi meter and applying the Bernoulli equation. The groups wrote a technical memo about their experiment and these memos were evaluated by the course instructor using the rubric shown in Figure 6-4.

Table 6-2 summarizes the results of this assessment. Students demonstrated superior performance in variable identification, standards identification, experiment preparation, appropriate sampling, and experimentation methods. Students also met the benchmark for their Analysis of Preliminary Results. Each team of students developed an experimental procedure that should have accomplished the stated objectives of the lab, but there was only some proficiency demonstrated in many teams' abilities to analyze the collected data and come to demonstrable conclusions.

In the future, faculty will prioritize having students draw meaningful conclusions from measured data in more structured experiments before asking students to develop their own means of analysis. This additional focus will be emphasized in the Fall, 2021 offering of ENGR 318 and Outcome 6 will be reassessed to determine the efficacy of these changes.

	Performance: Criteria	High Proficiency (4) The work meets listed requirements for this criterion; little to no development needed.	Proficiency (3) The work meets most requirements; minor development would improve the work.	Some Proficiency (2) The work needs moderate development in multiple requirements.	Limited Proficiency (1) The work does not meet this criterion: it needs substantial development in most requirements.
DEVELOP	Variable Identification	Student correctly identified all applicable variables	Student identified most, but not all, applicable variables	Student focused on inappropriate or unimportatnt variables	No evidence to suggest that student attempted to identify applicable variables
DEVELOP	Standards Identification	Student identified appropriate test standards/methodologies	Evidence suggests that student was aware of applicable test standards or methodologies but did not identify them	Student intended to use incorrect test standards or methodologies	Student did not plan to use any test standards/methodologies
DEVELOP	Experiment Preparation	Student chose/assembled appropriate test equipment/apparatus	Evidence suggests that student was aware of applicable test equipment or apparatus but did not identify	Student chose/assembled incorrect test equipment/apparatus	Student did not plan to use any equipment
CONDUCT	Appropriate Sampling	Student chose appropriate test sample	Student followed most, but not all, applicable sampling procedures	Student followed few of the applicable sampling procedures	No evidence to suggest that student attempted to obtain correct sample
CONDUCT	Experimentation Methods	Student followed appropriate standards/methodologies	Student followed most, but not all, applicable standards/methodologies	Student followed few of the applicable standards/methodologies	No evidence to suggest that student attempted to follow applicable standards/methodologies
CONDUCT	Analysis of Preliminary Results	Student accurately assessed and appropriately responded to preliminary (real-time) results	Student assessed and attempted to appropriately respond to real-time experimental results	Evidence suggests that student assessed real-time experimental data but made no attempt to respond appropriately	No evidence to suggest that student was tracking real-time results
ANALYZE & INTERPRET	Data Analysis and Interpretation	Student performed appropriate analysis and interpretation of test data	Student analyzed and interpreted test data with a few minor errors or assumptions	Student incorrectly analyzed and/or interpreted data	No evidence to suggest that student attempted to analyze and interpret test data
ANALYZE & INTERPRET	Arrives at Defendable Result	Student arrived at a reasonable and defendable result	Student arrived at a result that is defendable but not reasonable	Student's reported result is not supported by the data	No evidence provided to suggest that student arrived at any result

Figure 6-4. Experimentation Rubric.

Table 6-3. Summary of Second Assessment of Outcome 6.

Performance Criteria	Assessment Methods	Measurement Scale	Minimum Acceptable Performance	Results
Variable Identification	Faculty assessment of a Flow Through a Venturi Meter Laboratory Report	1 to 4 according to rubric	75% scoring 3 or higher	100% ≥ 3 70% = 4
Standards Identification				100% ≥ 3 90% = 4
Experiment Preparation				100% ≥ 3 100% = 4
Appropriate Sampling				100% ≥ 3 100% = 4
Experimentation Methods				100% ≥ 3 90% = 4
Analysis of Preliminary Results				100% ≥ 3 50% = 4
Data Analysis and Interpretation				30% ≥ 3 20% = 4
Arrives at Defendable Result				30% ≥ 3 20% = 4

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

The second assessment of Outcome 7 took place during fall term in CE 401-Civil Engineering Project I. Thirty students were asked to complete and submit a Technology Transfer Memo summarizing their research into a case study related to their design project. These memos were evaluated using the departments New Knowledge shown in Figure 6-5. The results of this assessment are summarized in Table 6-4, which reveals that all benchmarks for this assessment were met. No further action on this outcome is required.

Performance: Criteria	High Proficiency (4) The work meets listed requirements for this criterion; little to no development needed.	Proficiency (3) The work meets most requirements; minor development would improve the work.	Some Proficiency (2) The work needs moderate development in multiple requirements.	Limited Proficiency (1) The work does not meet this criterion: it needs substantial development in most requirements.
Acquire new knowledge as needed	Significant evidence of attempts to aquire multiple new pieces of knowledge or skills to complete project, task, or assignment	Evidence of attempts to aquire two or more new pieces of knowledge or skills to complete project, task, or assignment	Evidence of attempt to aquire single new piece of knowledge or skills to complete project, task, or assignment	No evidence of an attempt to aquire new knowledge or skills
Apply new knowledge as needed	Significant evidence of new knowledge being applied to project or work	Evidence of new knowledge being applied to project or work	Some evidence of new knowledge being applied to project or work	Limited evidence of new knowledge being applied to project or work
Use appropriate learning strategies	Used multiple strategies from high quality professional and technical sources	Used 1-2 strategies from high quality professional and technical sources	Used only strategies found from internet sources	Did not use any use any sources other than class to acquire new knowledge

Figure 6-5. New Knowledge Rubric.

Table 6-4. Summary of Second Assessment of Outcome 7.

Performance Criteria	Assessment Methods	Measurement Scale	Minimum Acceptable Performance	Results
Acquire new knowledge as needed	Technology Transfer memo - research for project case studies	1 to 4 according to rubric	75% scoring 3 or higher	100% ≥ 3 32% = 4
Apply new knowledge as needed				76% ≥ 3 20% = 4
Use appropriate learning strategies				100% ≥ 3 28% = 4

Section 7 – Closing the Loop: Evidence of Improvement in Student Learning.

No loop-closing assessments took place this academic year.