

Assessment of SLO # 1

Create written communications appropriate to the construction discipline

Create Written Communications



NAU Interpretation *Written communications appropriate to the construction discipline include agendas, daily field reports, RFIs, letters of intent and general business letters. At the 'Create' level, students will produce such documents.*

ID	Direct Assessment	Score*	Course Learning Outcome	Course
47	Write a business letter to identify safety issue	100% Exemplary	Organize, compose and edit useful construction business correspondence	S17 CM302W Prof. Writing
167	Letter of intent	100% Exemplary	Create written communications appropriate to project management	F16 CM489 Proj. Admin.
ID	Indirect Assessment	Score*	Course Learning Outcome	Course
211	AIC Exam	86% Pass	Create written communications	S17 AICEXAM AIC Exam
151	Look-ahead, daily reports	100% Exemplary	Establish agendas, conduct and document project job meetings, create daily field reports	F16 CM400L C4P Lab 3

* 'Score' shown is percent of students who meet or exceed the threshold of 70% on the assessment Unacceptable: < 50% -- Deficient: <70% -- Marginal: <85% -- Pass >= 85% -- Exemplary >= 95%

Discussion and Analysis

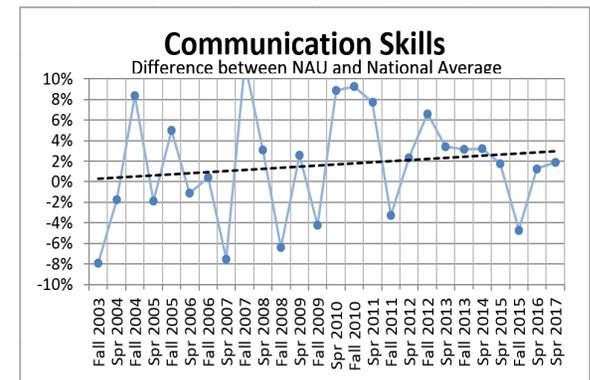
Written communication skills are an important component of the program that our stakeholders (employers who hire our graduates) greatly value. It is explicitly included as an outcome in 9 CM courses and most of the electives. Our assessments demonstrate that our students are meeting this learning outcome at the highest level. AIC Exam: For historical purposes, we have tracked this outcome on the AIC exam via the 'communication skills' category, however, it was moved to an 'indirect assessment' at the recommendation of AIC.

Next Steps

Maintain current curriculum in this area

	CID	IRM
CM200L	🚩	📊
CM222	🚩	📊
CM300L	🚩	📊
CM302W	✅	📊
CM360	🚩	📊
CM400L	✅	📊
CM481	🚩	📊
CM489	✅	📊
CM490C	🚩	📊
CM205	●	📊
CM403	●	
CM405	●	📊
CM408	●	📊
CM460	●	📊
ENG105	🚩	📊
AICEXAM	✅	

Legend			
Direct Assess.	✅	Introduce	📊
Indirect Assess.	✅	Reinforce	📊
In Curriculum	🚩	Master	📊
Elective	●		



Assessment of SLO # 2

Create oral presentations appropriate to the construction discipline

Create Oral Communications



NAU Interpretation *Creating oral presentations requires organizing and preparing verbal statements, developing supporting materials (handouts, slide decks) and delivering the presentation to an audience. Delivery includes both live and video formats. Types of oral presentations that are appropriate to the construction discipline include persuasive presentations of qualifications and proposals, informative talks (e.g. training seminars), and professional discourse (e.g. elevator speech).*

ID	Direct Assessment	Score*	Course Learning Outcome	Course
170	Video and oral presentation	91% Pass	Present proposal for steel subcontract bid	S17 CM331 Steel Systems
172	Video of elevator speech	100% Exemplary	Understand the role of a project manager on a jobsite and demonstrate the management skills necessary to effectively run a project including oral presentations	F16 CM489 Proj. Admin.

* 'Score' shown is percent of students who meet or exceed the threshold of 70% on the assessment Unacceptable: < 50% -- Deficient: <70% -- Marginal: <85% -- Pass >= 85% -- Exemplary >= 95%

Discussion and Analysis

Oral communication skills are important to future CM professionals. Formal oral presentations are included as part of multiple courses and electives. Overall, students are meeting this outcome at a high level. It should be noted that the most intensive practice in oral presentations is experienced by approximately one third of all CM students who elect to prepare for student competitions (CM205 & CM405). These students culminate their work with presentations to industry professionals in the competition setting. Our student teams have placed in the top three and individuals have earned 'best presenter' awards at the ASC regional and open competition. Students who have completed CM405 and the competition demonstrate oral presentation skills that far exceed those of students who do not compete. AIC: The AIC examination cannot measure a student's ability to create an oral presentation, so scores in this category are not considered an assessment of student learning.

Next Steps

Continue to encourage students to participate in the ASC student competition as a way for them to take their communication skills to the next level.

	CID	IRM
CM130		
CM331		
CM391		
CM489		
CM205		
CM403		
CM405		
CM408		
CST111		

Legend		
Direct Assess.		Introduce
Indirect Assess.		Reinforce
In Curriculum		Master
Elective		



NAU Interpretation

A safety plan is a written document that describes the process for identifying the physical and health hazards that could harm workers, procedures to prevent accidents, and steps to take when accidents occur. Creating a safety plan entails developing general safety policies at the organization level, site-specific plans at the project level and job hazard analyses at the task level. A project safety plan requires extensive understanding of construction materials, means and methods, as well as principles and standards for safety.

ID	Direct Assessment	Score*	Course Learning Outcome	Course
202	Project safety plan	83% Marginal	Create a Construction safety plan	F16 CM200L C4P Lab 1
132	Final project safety plan component	88% Pass	Describe the requirements for insuring safety on a structural steel job	S17 CM331 Steel Systems
173	Project safety plan	96% Exemplary	Create a construction project safety plan	S17 CM391 Safety
ID	Indirect Assessment	Score*	Course Learning Outcome	Course
148	Receives OSHA card	100% Exemplary	Meet the requirements for an OSHA thirty hour safety card	S17 CM391 Safety

* 'Score' shown is percent of students who meet or exceed the threshold of 70% on the assessment Unacceptable: < 50% -- Deficient: <70% -- Marginal: <85% -- Pass >= 85% -- Exemplary >= 95%

Discussion and Analysis

Safety is a high priority of our stakeholders and we have high expectations for our students in this category of learning. Our safety class (CM391) is taught by an OSHA 500 instructor and all students who meet the OSHA requirements earn a 30 hour card as part of our curriculum. Young students in the 200L course are required to create a construction safety plan with minimal formal training. The marginal score here is therefore not unexpected, however, we include this in our assessment plan as a progress check in this important area.

AIC: Since the AIC examination does not require students to create a safety plan, we cannot use this as an assessment

Next Steps

Increase formal safety plan training at the early levels (CM200L).

	CID	IRM
CM200L	✓	☐
CM331	✓	☐
CM391	✓	☐
CM205	●	☐
CM405	●	☐

Legend		
Direct Assess.	✓	Introduce ☐
Indirect Assess.	✓	Reinforce ☐
In Curriculum	🚩	Master ☐
Elective	●	

Assessment of SLO # 4

Create construction project cost estimates.

Create a Cost Estimate



NAU Interpretation

A construction project cost estimate is a comprehensive evaluation of project cost, broken down by scope of work, that includes labor, equipment and materials as well as overhead and profit margins. To create a cost estimate, students will perform a material take-off and apply unit costs to the resulting quantities. Included in this outcome are the scaffolding skills of performing material quantity take-offs from plans and specifications using both manual (paper) and digital methods, differentiating scopes of work, and determining unit costs.

ID	Direct Assessment	Score*	Course Learning Outcome	Course
122	Final Project	60% Deficient	Develop estimates for typical construction management functions including general conditions, general overhead, insurance, and profit	S16 CM329 Estimating
176	Generate cost estimate for steel scope of work in final project	88% Pass	Create a cost estimate for steel subcontract	S17 CM331 Steel Systems
175	create GMP estimate	100% Exemplary	Create a detailed cost estimate for a commercial construction project	S17 CM490C Capstone
ID	Indirect Assessment	Score*	Course Learning Outcome	Course
214	AIC Exam	81% Marginal	Create construction project cost estimates	S17 AICEXAM AIC Exam

* 'Score' shown is percent of students who meet or exceed the threshold of 70% on the assessment Unacceptable: < 50% -- Deficient: <70% -- Marginal: <85% -- Pass >= 85% -- Exemplary >= 95%

Discussion and Analysis

Cost estimating is an important skill for construction managers to master. Students demonstrate skill at all levels of this learning outcome. In CM331 (Steel) they must perform a detailed take-off of the steel scope of work for a project and apply unit costs to come up with a subcontract bid. This demonstrates mastery in the scaffolding skills above as well. In CM329 (Estimating), the deficient score was due to many students missing a bid deadline (20% deduction) and not necessarily because of a lack of mastery of content. In their capstone course (CM490C), all students are able to assemble trade partner bids into a GMP estimate, evaluating different bids against scope of work requirements.

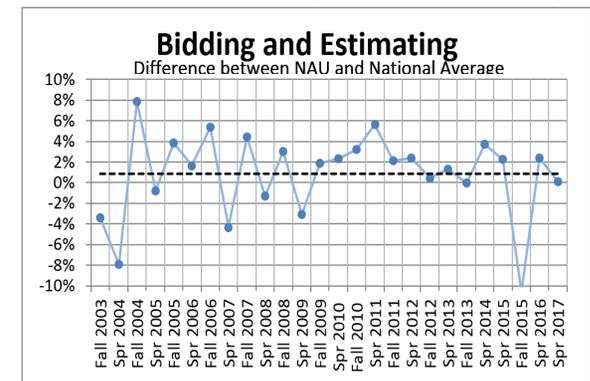
AIC: Bidding and Estimating has long been tracked by our program through the AIC examination, so we retain this assessment (moving it to an indirect assessment per AIC recommendations). While not meeting our goal of 85% of students passing, they continue to track at or above the national average in this category.

Next Steps

The results of this assessment indicate that student need to work on professional skills (meeting deadline in CM329). For future data reporting, split out content mastery score on CM329 Final Project.

	CID	IRM
CM123	🚩	📊
CM222	🚩	📊
CM326	🚩	📊
CM329	✅	📊
CM331	✅	📊
CM360	🚩	📊
CM490C	✅	📊
CM205	●	📊
CM405	●	📊
AICEXAM	✅	📊

Legend		
Direct Assess.	✅ Introduce	📊
Indirect Assess.	✅ Reinforce	📊
In Curriculum	🚩 Master	📊
Elective	●	





Create construction project schedules.

NAU Interpretation

A construction project schedule includes activities, milestones and deliverables for a project, broken down by scope of work loaded with durations. To create a schedule, students identify and logically organize activities and determine durations based on quantity of work. These activities are linked via a network of dependencies which allow for determination of critical tasks and paths. Included in this outcome are the scaffolding skills of using scheduling software (e.g. Microsoft Project), determining activity durations from quantities and unit durations, and understanding other factors that affect construction schedules.

ID	Direct Assessment	Score*	Course Learning Outcome	Course
178	Schedule for steel scope of work in final project	88% Pass	Create schedule for steel construction	S17 CM331 Steel Systems
143	Project schedule assignment	100% Exemplary	Understand the logic and be able to prepare a detailed construction project schedule	F16 CM388 Scheduling
160	Create CPM project schedule	93% Pass	Develop a detailed schedule for a construction project and calculate critical path using precedence logic	S17 CM490C Capstone

ID	Indirect Assessment	Score*	Course Learning Outcome	Course
215	AIC Exam	83% Marginal	Create construction project schedules	S17 AICEXAM AIC Exam

* 'Score' shown is percent of students who meet or exceed the threshold of 70% on the assessment Unacceptable: < 50% -- Deficient: <70% -- Marginal: <85% -- Pass >= 85% -- Exemplary >= 95%

Discussion and Analysis

Students are meeting this outcome in our courses. Like with cost estimating, this demonstrates that they have also mastered the prerequisite scaffolding skills listed above.

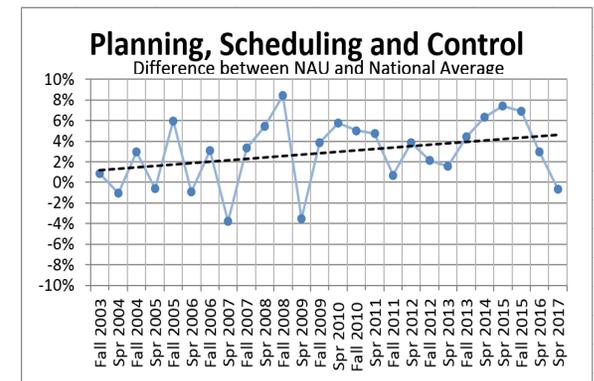
AIC: The category of "Planning, Scheduling and Control" has long been tracked by our program through the AIC examination, so we retain this assessment (moving it to an indirect assessment per AIC recommendations). Historically, student scores in this combined category have maintained an upward trajectory, however, scores in the last two years have been poor, even though 83% of students are passing the scheduling component.

Next Steps

Maintain current curriculum in this area.

	CID	IRM
CM130		
CM331		
CM388		
CM490C		
CM205		
CM405		
AICEXAM		

Legend		
Direct Assess.		Introduce
Indirect Assess.		Reinforce
In Curriculum		Master
Elective		



Assessment of SLO # 6

Analyze professional decisions based on ethical principles.

Analyze using Ethical Principles



NAU Interpretation Ethical principles are ones in which pertain to right and wrong conduct, in accordance with the rules, norms and standards of the construction profession. To analyze professional decisions, students are expected to explore relationships among the components of a situation which lead to decision making.

ID	Direct Assessment	Score*	Course Learning Outcome	Course
216	AIC Exam	92% Pass	Analyze decisions based on ethical principles	S17 AICEXAM AIC Exam
179	Case study - response to boss	84% Marginal	Analyze human behavior and ethical decision making in the construction prodes	S16 CM302W Prof. Writing
180	In-class assignment on unforeseen conditions	100% Exemplary	Develop critical leadership and decision making skills, based on ethical principles that will be necessary the management of a project and the people associated with the project	S17 CM481 Operations

ID	Indirect Assessment	Score*	Course Learning Outcome	Course
233	Number of students passing business class	100% Exemplary	Complete business course with passing grade	ACC205 Business Law

* 'Score' shown is percent of students who meet or exceed the threshold of 70% on the assessment Unacceptable: < 50% -- Deficient: <70% -- Marginal: <85% -- Pass >= 85% -- Exemplary >= 95%

Discussion and Analysis

Students are meeting this outcome on two of three direct assessments, and only narrowly missing it on the third (in their professional writing class). Students are exposed to norms of the construction profession as they mature in their college career, taking advantage of weekly extra-curricular seminars and internships. It is promising that they demonstrate better outcomes later in their careers (AIC exam and CM481 - Operations). All students earning CM degrees must pass ACC205, although only 82% of students taking this course in F16 passed, meaning that a considerable number of students are required to re-take this course in order to graduate.

AIC: Although ethical principles were not historically tracked using the AIC examination, we have chosen to include this category as a direct assessment since this was an area of weakness identified in a past ACCE review cycle.

Next Steps

Course outcomes explicitly mapping to this SLO are not included in first and second year courses. Since this is such an important skill for professional construction managers. We will review formally introducing this earlier in the curriculum, perhaps in CM120 (Building the Human Environment).

	CID	IRM
CM302W	✓	☐☐
CM329	⚠	☐☐
CM481	✓	☐☐
CM490C	⚠	☐☐
ACC205	✓	
AICEXAM	✓	

Legend		
Direct Assess.	✓	Introduce ☐☐
Indirect Assess.	✓	Reinforce ☐☐
In Curriculum	⚠	Master ☐☐
Elective	●	

Assessment of SLO # 7

Analyze construction documents for planning and management of construction processes.

Analyze Const.
Docs. to Manage



NAU Interpretation Construction documents include contracts, plans and specifications that define the work to be done on a project. Analyzing construction documents for planning and management purposes means that students must go beyond understanding the content of those records. They must be able to examine and distinguish the interrelated content in order to determine scopes of work that are necessary to organize and manage a project. These skills are necessary for the higher level outcomes (e.g. creating a schedule, cost estimate and safety plans). Included in this outcome are the scaffolding tasks of plan and specification reading.

ID	Direct Assessment	Score*	Course Learning Outcome	Course
97	Daily reports	100% Exemplary	Interpret project drawings and specifications	CM200L C4P Lab 1
123	Scope of work assignment	100% Exemplary	Create scopes of work for major subcontractors, and evaluate sub pricing during the bidding process	F15 CM329 Estimating
181	Site logistics plan assignment	98% Exemplary	Create a site logistics plan for steel construction	S17 CM331 Steel Systems

* 'Score' shown is percent of students who meet or exceed the threshold of 70% on the assessment Unacceptable: < 50% -- Deficient: <70% -- Marginal: <85% -- Pass >= 85% -- Exemplary >= 95%

Discussion and Analysis

Assessment results for this outcome demonstrate that students are doing an exemplary job of analyzing construction documents. Students also demonstrate mastery of scaffolding skills of plan reading and system recognition. AIC: We do not have historical data to track student learning via the AIC examination in this category. AIC does not recommend that results for this outcome be used as a direct assessment, so we rely on the other listed assessments in this area.

Next Steps

Maintain current curriculum in this area.

	CID	IRM
CM200L	✓	☐☐
CM220	🚩	☐☐
CM222	🚩	☐☐
CM225	🚩	☐☐
CM302W	🚩	☐☐
CM326	🚩	☐☐
CM329	✓	☐☐
CM331	✓	☐☐
CM400L	🚩	☐☐
CM490C	🚩	☐☐
CM205	●	☐☐
CM405	●	☐☐
CM460	●	☐☐

Legend		
Direct Assess.	✓	Introduce ☐☐
Indirect Assess.	✓	Reinforce ☐☐
In Curriculum	🚩	Master ☐☐
Elective	●	

Assessment of SLO # 8

Analyze methods, materials, and equipment used to construct projects.

Analyze Means and Methods



NAU Interpretation Analyzing methods, materials and equipment used to construct projects means that students are able to differentiate among available options to complete construction tasks and select appropriate solutions. This outcome includes the scaffolding skills of understanding the basics of different construction materials including their properties and means and methods of construction.

ID	Direct Assessment	Score*	Course Learning Outcome	Course
218	AIC Exam	72% Marginal	Analyze methods, materials, and equipment	S17 AICEXAM AIC Exam
85	Detail Notebook	93% Pass	Classify the primary construction systems used to build residential projects.	S17 CM123 Methods 1
183	Site Logistics assignment (crane selection)	95% Exemplary	select a crane for use in setting structural steel	S17 CM331 Steel Systems
141	Final Project	100% Exemplary	Select appropriate equipment using manufacturer's specifications and project constraints	F16 CM360 Soils

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Discussion and Analysis

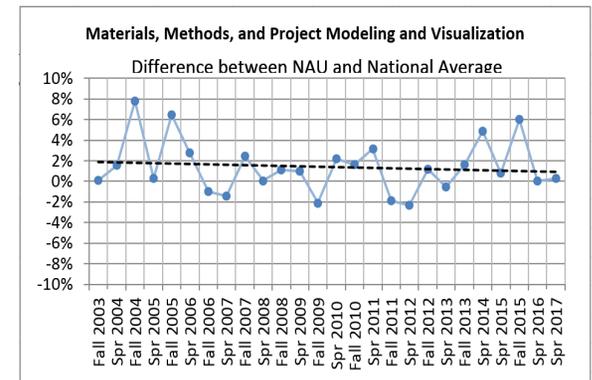
This learning outcome is well scaffolded in our curriculum. In order for students to accomplish higher level learning outcomes, they must have a strong understanding of means and methods of construction in the different trades. Excepting for the score on the AIC examination, our students are showing a high level of competence with this learning outcome. AIC: We have historically tracked "Materials, Methods and Projects Modeling and Visualization" through the AIC examination and retain this category as an assessment for this outcome. Historically, our students have tracked above the national average in this category, with improving scores in the past few years.

Next Steps

Identify the discrepancy between our internal assessments and the focus of the AIC examination in this category. Maintain current curriculum in this area.

	CID	IRM
CM120	🚩	📄
CM123	✅	📄
CM200L	🚩	📄
CM220	🚩	📄
CM223	🚩	📄
CM225	🚩	📄
CM331	✅	📄
CM360	✅	📄
CM205	●	📄
CM425	●	📄
CM460	●	📄
AICEXAM	✅	

Legend		
Direct Assess.	✅ Introduce	📄
Indirect Assess.	👍 Reinforce	📄
In Curriculum	🚩 Master	📄
Elective	●	



Assessment of SLO # 9

Apply Team Skills



Apply construction management skills as a member of a multi-disciplinary team.

NAU Interpretation *The construction management profession requires an ability to work with others to complete a project. This includes coordination, communication and leadership skills. Applying these skills as a member of a multi-disciplinary team involves working with others to collaboratively complete a project. Included in this outcome are the scaffolding skills of management and marketing.*

ID	Direct Assessment	Score*	Course Learning Outcome	Course
126	Final Report	86% Pass	Assume the role of the builder on a construction project	F16 CM200L C4P Lab 1
125	Project Manual	96% Exemplary	Assume the role of a design professional on a construction project	S17 CM300L C4P Lab 2
149	Final Report	100% Exemplary	Coordinate, direct, and manage the activities of a construction team	F16 CM400L C4P Lab 3

* 'Score' shown is percent of students who meet or exceed the threshold of 70% on the assessment Unacceptable: < 50% -- Deficient: <70% -- Marginal: <85% -- Pass >= 85% -- Exemplary >= 95%

Discussion and Analysis

As a cornerstone of our curriculum, the vertically integrated C4P lab (CM200L, CM300L and CM400L) provides our students with an unparalleled experience working as a member of a multi-disciplinary team, consecutively in three separate roles (builder, designer, manager). Individual student evaluation on team projects utilizes the CATME peer evaluation tool (see appendix) to provide an accurate assessment of individual work on the course projects. Students are demonstrating proficiency on this outcome, with a positive trend from sophomore year (CM200L) to senior year (CM400L)
AIC: It is unclear how the AIC examination can measure application of skill on a multi-disciplinary team so results in this category reported by AIC are not a useful assessment.

Next Steps

There appears to be room to improve performance at the sophomore (CM200L) level on this outcome. This could be done by activating the managers (CM400L students) to engage in team-building exercises early on in the semester.

	CID	IRM
CM200L	✓	☐☐
CM300L	✓	☐☐
CM400L	✓	☐☐
CM205	●	☐☐
CM405	●	☐☐
CM460	●	☐☐
MGT303	🚩	☐☐
MKT303	🚩	☐☐

Legend			
Direct Assess.	✓	Introduce	☐☐
Indirect Assess.	✓	Reinforce	☐☐
In Curriculum	🚩	Master	☐☐
Elective	●		

Assessment of SLO # 10

Apply electronic-based technology to manage the construction process.

Apply Technology to Manage



NAU Interpretation *Electronic-based technology used to manage the construction process includes software used for design (e.g. Revit), documentation (e.g. MS Word & PowerPoint) and productivity (e.g. MS Project, Excel, On Screen Takeoff, Bluebeam). Other software (Navis Manage) and Cloud-based solutions (e.g. Bluebeam Studio), coupled with hardware (mobile devices, computers) bring together resources to aid in managing the construction process. Applying technology as a management tool requires utilization of software and hardware to execute project management tasks. This outcome is scaffolded by basic technology literacy and skills using software.*

ID	Direct Assessment	Score*	Course Learning Outcome	Course
114	Construction Documents in Project Manual	96% Exemplary	Create construction documents using BIM tools	S17 CM300L C4P Lab 2
184	bluebeam project	100% Exemplary	manage project information using cloud based document management system	F16 CM400L C4P Lab 3

* 'Score' shown is percent of students who meet or exceed the threshold of 70% on the assessment Unacceptable: < 50% -- Deficient: <70% -- Marginal: <85% -- Pass >= 85% -- Exemplary >= 95%

Discussion and Analysis

The essence of this outcome was specifically targeted when the C4P lab was created in 2012. The use of Revit to model and produce construction documents for a project that is actually being built allows students to experience situations which are not possible in a traditional course. The use of Bluebeam Studio to manage the process in real-time is an integral experience that is achieved in the C4P lab. Students are meeting this outcome at a high level.

AIC: The AIC examination does not provide the experience of managing a project and so results in this area do not provide a useful assessment of our students' learning.

Next Steps

*Maintain current curriculum in this area.
Explore the potential of using other PM software solutions (like Procore)*

	CID	IRM
CM130		
CM200L		
CM222		
CM300L		
CM329		
CM388		
CM400L		
CM425		

Legend			
Direct Assess.		Introduce	
Indirect Assess.		Reinforce	
In Curriculum		Master	
Elective			

Assessment of SLO # 11

Apply basic surveying techniques for construction layout and control.

Apply Survey Techniques



NAU Interpretation *Basic surveying techniques for construction include performing level loops, topographic surveys and establishing location of points. Applying these techniques involves using auto levels, total stations and steel tapes to establish coordinates and elevations of points shown on construction drawings or in concert with existing conditions to determine coordinates and elevations of points. Included in this outcome are the scaffolding skills of understanding survey terminology, setting up instruments and processing survey data.*

ID	Direct Assessment	Score*	Course Learning Outcome	Course
185	Daily Report 1: layout	100% Exemplary	Layout project using project control	S17 CM200L C4P Lab 1
39	Construction Staking Lab	100% Exemplary	Layout points for construction using control system	S17 CM253 Surveying
37	Lab practical exam	100% Exemplary	Operate and perform basic measurement and layout tasks using chains, levels and total stations	S17 CM253 Surveying

ID	Indirect Assessment	Score*	Course Learning Outcome	Course
221	AIC Exam	75% Marginal	Apply basic surveying technology for layout	S17 AICEXAM AIC Exam

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Discussion and Analysis

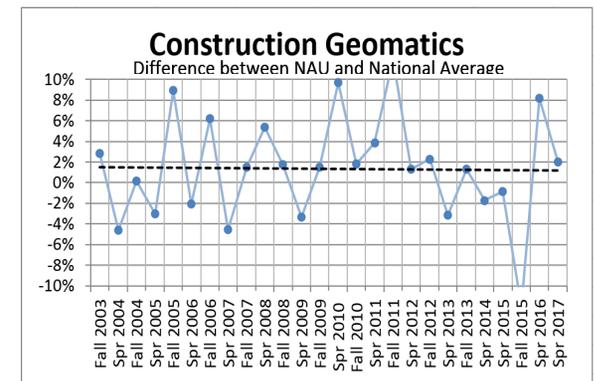
The program of study for CM includes a full three-credit course in surveying. Students are meeting our intended learning outcome both in the instructional laboratory setting (CM253) and in practical application (CM200L). AIC: We have historically tracked surveying ("Construction Geomatics") via the AIC examination. Student scores on this assessment have varied widely and so we have been watching it as an area of concern. Since the examination cannot assess practical application of layout and control and only has a few questions dedicated to this topic, we classify this as an indirect assessment of student learning.

Next Steps

Maintain current curriculum in this area.

	CID	IRM
CM200L	✓	☐☐
CM253	✓	☐☐
CM400L	🚩	☐☐
AICEXAM	✓	

Legend		
Direct Assess.	✓	Introduce ☐☐
Indirect Assess.	✓	Reinforce ☐☐
In Curriculum	🚩	Master ☐☐
Elective	●	



Assessment of SLO # 12

Understand different methods of project delivery and the roles and responsibilities of all constituencies

Understand Proj. Delivery



NAU Interpretation Common methods of project delivery include Design-Build-Build (DBB), CM at Risk (CMaR), Design-Build (DB), Integrated Project Delivery (IPD) and Job Order Contracting (JOC). To demonstrate understanding, students must be able to compare and contrast characteristics of these methods.

ID	Direct Assessment	Score*	Course Learning Outcome	Course
104	Division Zero homework	98% Exemplary	Describe common project delivery methods including DBB, CMAR, DB, IPD and JOC	F16 CM223 Methods 2
156	Quiz on project delivery	95% Exemplary	Understand the role of a project manager on a jobsite and demonstrate the management skills necessary to effectively run a project including oral presentations	F16 CM489 Proj. Admin.

* 'Score' shown is percent of students who meet or exceed the threshold of 70% on the assessment Unacceptable: < 50% -- Deficient: <70% -- Marginal: <85% -- Pass >= 85% -- Exemplary >= 95%

Discussion and Analysis

Students demonstrate that they are able to describe common project delivery methods in a 200 level course and maintain this ability through their senior year. Students who are interested in project delivery methods can elect to take CM425 (Integrated Project Delivery) to take their learning to a higher level.

AIC: We have not historically tracked this category using the AIC examination and as such do not include it in our current assessment plan. However students do not appear to be scoring well in this category (61% passing) and so this may justify some additional attention.

Next Steps

Identify, if possible, the discrepancy between our internal assessments and the focus of the AIC examination in this category. Maintain current curriculum in this area.

	CID	IRM
CM123		
CM223		
CM489		
CM425		

Legend		
Direct Assess.		Introduce
Indirect Assess.		Reinforce
In Curriculum		Master
Elective		

Assessment of SLO # 13

Understand construction risk management.

Understand Risk Mgmt.



NAU Interpretation Risk on a construction project includes safety hazards, financial risk and contractual risk. To demonstrate understanding, students need to be able to summarize factors that contribute to these risks and identify ways of mitigating those risks.

ID	Direct Assessment	Score*	Course Learning Outcome	Course
146	Photo Case Study assignment	100% Exemplary	Identify construction hazards and develop strategies that can be used to reduce or eliminate typical construction safety related issues. Ascertain which OSHA guidelines apply to this hazard	F16 CM391 Safety
189	General Conditions Risk assessment assignment	90% Pass	Understand the intricacies of differing contractual relationships between an owner and a contractor that affect the way a project should be approached and ran.	F16 CM489 Proj. Admin.

* 'Score' shown is percent of students who meet or exceed the threshold of 70% on the assessment Unacceptable: < 50% -- Deficient: <70% -- Marginal: <85% -- Pass >= 85% -- Exemplary >= 95%

Discussion and Analysis

Students demonstrate successful learning in both areas of risk management: safety and financial.

AIC: We have not historically tracked risk management using the AIC examination and as such do not include it in our current assessment plan. However students only appear to be scoring marginally well in this category (63% passing).

Next Steps

Assess alignment of AIC examination with this outcome for potential inclusion as future assessment.

Maintain current curriculum in this area.

	CID	IRM
CM391	✓	☐☐
CM481	🚩	☐☐
CM489	✓	☐☐
FIN303	🚩	☐☐

Legend		
Direct Assess.	✓	Introduce ☐☐
Indirect Assess.	👍	Reinforce ☐☐
In Curriculum	🚩	Master ☐☐
Elective	●	

Assessment of SLO # 14

Understand construction accounting and cost control.

Understand Cost Control



NAU Interpretation Cost control, monitoring and accounting on a construction project serves the purpose of recording financial transactions and measuring progress on a project relative to projections. To demonstrate understanding, students must be able to describe these processes and their relationships to the construction profession.

ID	Direct Assessment	Score*	Course Learning Outcome	Course
224	AIC Exam	75% Marginal	Understand construction accounting & cost control	S17 AICEXAM AIC Exam
157	Project Cost Summary / Labor Cost report / Earned work hour report	97% Exemplary	Demonstrate the ability to use project management tools to effectively control quality, schedule and costs on a project	F16 CM489 Proj. Admin.
161	Create and manage pay applications, create change order and discuss reasoning in case study paper	100% Exemplary	Develop a cost / schedule control system that can be used to project variations in schedule, budget, and cash flow	S17 CM490C Capstone

ID	Indirect Assessment	Score*	Course Learning Outcome	Course
207	Grade in Class	100% Exemplary	Complete business course with passing grade	F16 ACC255 Fin. Accounting
210	Grade in class	100% Exemplary	Complete business course with passing grade	ACC256 Managerial Acco

* 'Score' shown is percent of students who meet or exceed the threshold of 70% on the assessment Unacceptable: < 50% -- Deficient: <70% -- Marginal: <85% -- Pass >= 85% -- Exemplary >= 95%

	CID	IRM
CM489	✓	☐☐
CM490C	✓	☐☐
CM460	●	☐☐
ECO280	🚩	☐☐
ACC255	✓	☐☐
ACC256	✓	☐☐
AICEXAM	✓	

Discussion and Analysis

Students demonstrate competency on this learning outcome in their senior-level courses. As part of their business classes (ACC255, ACC256), students are exposed to both financial and managerial accounting practices. They then apply them in the context of construction in their upper-division CM courses to graduate.

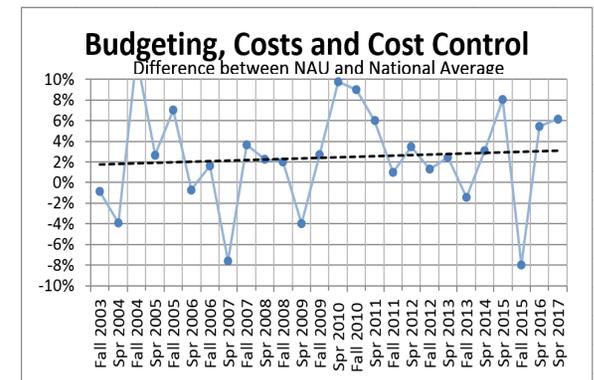
All students earning CM degrees must pass ACC255 and ACC256 to graduate. In F16, 96% of CM students passed ACC255 but only 83% of CM students passed ACC256. Students not passing in any given semester are required to retake the course.

AIC: We have historically tracked "Budgeting, Costs and Cost Control" using the AIC examination and retain this as a direct assessment. Although only 75% of students pass this category of the exam, the historical trend has been upward.

Next Steps

Maintain current curriculum in this area.

Legend		
Direct Assess.	✓	Introduce ☐☐
Indirect Assess.	✓	Reinforce ☐☐
In Curriculum	🚩	Master ☐☐
Elective	●	





Understand construction quality assurance and control.

NAU Interpretation *Quality assurance and quality control (QA/QC) are a set of processes used to ensure that resulting products meet required standards. Students create checklists and implement quality control plans to demonstrate understanding in this area.*

ID	Direct Assessment	Score*	Course Learning Outcome	Course		
201	Project Notebook	93% Pass	Describe basic quality control systems used on residential construction projects.	S17	CM123	Methods 1
203	Industry quality assessment checklist	100% Exemplary	Implement a quality control program	S17	CM200L	C4P Lab 1
190	Quality Control checklist assignment	100% Exemplary	Understand Quality Control and Create a Quality Control Checklist	S17	CM481	Operations

* 'Score' shown is percent of students who meet or exceed the threshold of 70% on the assessment Unacceptable: < 50% -- Deficient: <70% -- Marginal: <85% -- Pass >= 85% -- Exemplary >= 95%

Discussion and Analysis

Quality control has been identified by our industry stakeholders as an important topic. Our IAB curriculum committee review has led to the modification of CM200L (Integrated Lab 2) to add this assessment. Students go beyond understanding QA/QC and apply it in their laboratory experience. Quality of final product is assessed by industry experts in the C4P lab. AIC: We have not historically tracked QA/QC using the AIC examination and do not include it in our assessment plan. However, students do not perform well on this category in the examination (<50%). This is a concern that merits further investigation.

Next Steps

Assess alignment of AIC examination with this outcome for potential inclusion as future assessment. Maintain current curriculum in this area.

	CID	IRM
CM123	✓	☐☐
CM200L	✓	☐☐
CM400L	🚩	☐☐
CM481	✓	☐☐
CM460	●	☐☐

Legend		
Direct Assess.	✓	Introduce ☐☐
Indirect Assess.	☑	Reinforce ☐☐
In Curriculum	🚩	Master ☐☐
Elective	●	

Assessment of SLO # 16

Understand construction project control processes.

Understand Proj. Control



NAU Interpretation Construction project control processes are concerned the interrelationship among cost, schedule, logistics and materials on a project. Students illustrate the relationships among these influences to demonstrate understanding.

ID	Direct Assessment	Score*	Course Learning Outcome	Course
153	Procurement log assignment	97% Exemplary	Create and implement a project procurement system and understand how this relates to the successful management of a jobsite	S17 CM481 Operations
200	Project control flow chart	95% Exemplary	Develop a control system for a commercial construction project	S17 CM490C Capstone
ID	Indirect Assessment	Score*	Course Learning Outcome	Course
226	AIC Exam	83% Marginal	Understand construction project control processes	S17 AICEXAM AIC Exam

* 'Score' shown is percent of students who meet or exceed the threshold of 70% on the assessment Unacceptable: < 50% -- Deficient: <70% -- Marginal: <85% -- Pass >= 85% -- Exemplary >= 95%

Discussion and Analysis

Students are meeting this outcome in their senior level courses. Capstone provides a unique opportunity for students to demonstrate relationships among parts of a construction project.

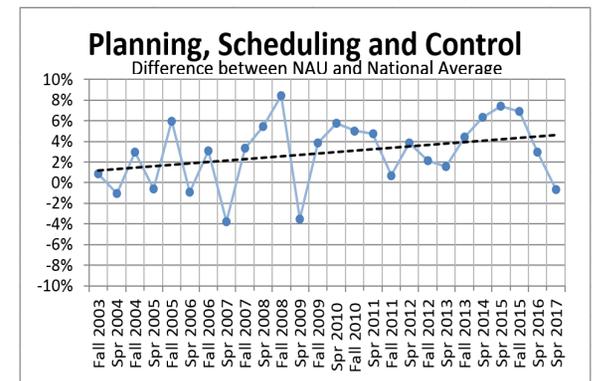
AIC: We have historically tracked "Planning, Scheduling and Control" using the AIC examination. The current AIC report on outcomes split out Scheduling from project control, so we are tracking this as an indirect assessment.

Next Steps

Maintain current curriculum in this area.

	CID	IRM
CM331	🚩	☐☐
CM360	🚩	☐☐
CM388	🚩	☐☐
CM400L	🚩	☐☐
CM481	✅	☐☐
CM490C	✅	☐☐
ACC256	🚩	
AICEXAM	✅	

Legend		
Direct Assess.	✅ Introduce	☐☐
Indirect Assess.	✅ Reinforce	☐☐
In Curriculum	🚩 Master	☐☐
Elective	●	



Assessment of SLO # 17

Understand the legal implications of contract, common, and regulatory law to manage a construction

Understand Legal & Contract



NAU Interpretation *Regulations, contracts and common law affect the management of a construction project. Students demonstrate understanding by relating the legal implications to the construction profession.*

ID	Direct Assessment	Score*	Course Learning Outcome	Course
158	Write a subcontract	100% Exemplary	Understand the intricacies of differing contractual relationships between an owner and a contractor that affect the way a project should be approached and ran.	F16 CM489 Proj. Admin.

ID	Indirect Assessment	Score*	Course Learning Outcome	Course
206	Grade in class	100% Exemplary	Complete business course with passing grade	ACC205 Business Law

* 'Score' shown is percent of students who meet or exceed the threshold of 70% on the assessment Unacceptable: < 50% -- Deficient: <70% -- Marginal: <85% -- Pass >= 85% -- Exemplary >= 95%

	CID	IRM
CM123		
CM489		
CM425		
ACC205		

Discussion and Analysis

Students meet this learning outcome. In their Introduction to Business Law (ACC205) course, students receive a full primer on business law. All students earning CM degrees must pass this course. In F16, 82% of CM students passed ACC205. Students not passing in any given semester are required to retake the course.

AIC: We have not historically tracked this category using the AIC examination and as such do not include it as a measure of student learning. However, students are not doing well in this category (58%) which indicates a potential disconnect.

Next Steps

*Assess alignment of AIC examination with this outcome for potential inclusion as future assessment.
Maintain current curriculum in this area.*

Legend		
Direct Assess.		Introduce
Indirect Assess.		Reinforce
In Curriculum		Master
Elective		

Assessment of SLO # 18

Understand the basic principles of sustainable construction.

Understand Sustainable



NAU Interpretation *Basic principles of sustainable construction include optimizing resource use, enhancing indoor environmental quality and considering full life-cycle costs. Students demonstrate understanding of these principles in the context of construction materials and systems.*

ID	Direct Assessment	Score*	Course Learning Outcome	Course		
43	Design a house	97% Exemplary	Research and Design a conceptual plan for a high performance house	S17	CM120	Human Environ
195	Heating and cooling analysis assignment	100% Exemplary	Distinguish between the use of active and passive means, methods, and materials used to achieve an energy efficient building envelop	S17	CM326	MEP

* 'Score' shown is percent of students who meet or exceed the threshold of 70% on the assessment Unacceptable: < 50% -- Deficient: <70% -- Marginal: <85% -- Pass >= 85% -- Exemplary >= 95%

Discussion and Analysis

Students are introduced to sustainable principles in their first semester CM course (CM120). These principles are reinforced throughout the curriculum, especially in the MEP course (CM326). Interested students can elect to take our Sustainability elective (CM403) which is co-convened with graduate students. Students are meeting this outcome at a high level.
AIC: We have not historically tracked this category using the AIC examination and as such do not include it as a measure of student learning. However, students are not doing well in this category on the exam (58%) which indicates the need for further review.

Next Steps

Assess alignment of AIC examination with this outcome for potential inclusion as future assessment. Maintain current curriculum in this area.

	CID	IRM
CM120	✓	☐☐
CM223	🚩	☐☐
CM326	✓	☐☐
CM403	●	☐☐

Legend		
Direct Assess.	✓	Introduce ☐☐
Indirect Assess.	✓	Reinforce ☐☐
In Curriculum	🚩	Master ☐☐
Elective	●	

Assessment of SLO # 19

Understand the basic principles of structural behavior.

Understand Structural Principles



NAU Interpretation *Basic principles of structural behavior include loading determination, load path tracing, mechanical properties of materials, basic static equilibrium and component behavior (beams, columns, foundations). Students demonstrate understanding by applying loads and determining resulting behaviors using principles and design aids.*

ID	Direct Assessment	Score*	Course Learning Outcome	Course
19	House design project	93% Pass	Use design aids to select adequate components for simple structural systems	S16 CM220 Structures
129	Beam and Girder Design Assignment	95% Exemplary	Perform structural analysis of simple buildings and building components	S17 CM331 Steel Systems
ID	Indirect Assessment	Score*	Course Learning Outcome	Course
229	AIC Exam	58% Deficient	Understand the principles of structural behavior	S17 AICEXAM AIC Exam

* 'Score' shown is percent of students who meet or exceed the threshold of 70% on the assessment Unacceptable: < 50% -- Deficient: <70% -- Marginal: <85% -- Pass >= 85% -- Exemplary >= 95%

Discussion and Analysis

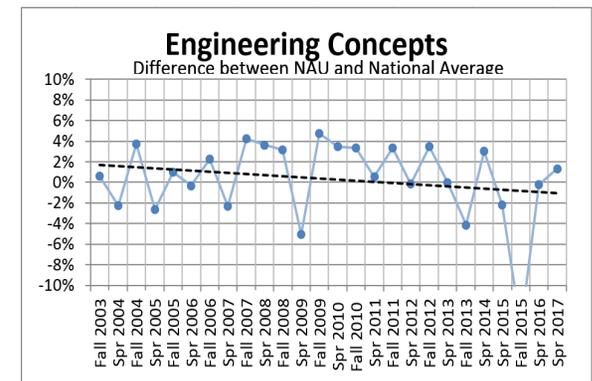
Students demonstrate proficiency with concepts of structural behavior that go beyond the basic level of understanding. In our Structures (CM220) and Steel (CM331) courses, students apply these principles to analysis and design problems. AIC: We have historically used "Engineering Principles" as a proxy for Structural principles from the AIC examination. National averages in this category have traditionally been low, as this is a challenging topic for many CM students. While our score indicates deficiency on this indirect assessment, we understand engineering principles make up only a small portion of the AIC examination. We retain this as an indirect assessment for these historical purposes.

Next Steps

Continue to study the discrepancy between our internal assessments and the focus of the AIC examination in this category. Maintain current curriculum in this area.

	CID	IRM
CM220	✓	☐☐
CM223	🚩	☐☐
CM225	🚩	☐☐
CM331	✓	☐☐
CM360	🚩	☐☐
AICEXAM	✓	

Legend		
Direct Assess.	✓	Introduce ☐☐
Indirect Assess.	✓	Reinforce ☐☐
In Curriculum	🚩	Master ☐☐
Elective	●	



Assessment of SLO # 20

Understand the basic principles of mechanical, electrical and piping systems.

Understand MEP Principles



NAU Interpretation *Mechanical, Electrical and Plumbing (MEP) systems are the complex life-blood of a building. Students demonstrate understanding by explaining the basic function of each of these systems.*

ID	Direct Assessment	Score*	Course Learning Outcome	Course
118	Heating and cooling analysis assignment	100% Exemplary	Distinguish between the use of active and passive means, methods, and materials used to achieve an energy efficient building envelop	S17 CM326 MEP
115	Drain, waste and Vent assignment	100% Exemplary	Identify the means, methods, and materials commonly used in the construction of commercial building MEP systems	S17 CM326 MEP

* 'Score' shown is percent of students who meet or exceed the threshold of 70% on the assessment Unacceptable: < 50% -- Deficient: <70% -- Marginal: <85% -- Pass >= 85% -- Exemplary >= 95%

Discussion and Analysis

Students must complete a complete course in Mechanical, Electrical and Plumbing Systems (CM326). Students go beyond a basic understanding of these systems and successfully apply the principles in areas such as heating and cooling analyses. AIC: We have not historically tracked this category using the AIC examination and as such do not include it in our assessment plan.

Next Steps

Maintain current curriculum in this area.

	CID	IRM
CM123		
CM223		
CM326		

Legend			
Direct Assess.		Introduce	
Indirect Assess.		Reinforce	
In Curriculum		Master	
Elective			