Mechanical Engineering Tech. (AAS)
Canino School of Engineering Technology
2017Assessment Report

- **Curriculum Coordinator: Daniel Miller**
- **Date of Presentation: January 17, 2018**

SUNY CANTON

What was assessed? Student learning outcomes list:

- *PSLO 3 (ABET C) – Test and Measurement Skills*
  - *An ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes*

- *PSLO 4 (ABET D) – System Design Skills*
  - *An ability to design systems, components, or processes for broadly-defined engineering technology problems appropriate to program educational objectives*

What was assessed? Student learning outcomes list:

- *PSLO 6 (ABET F) – Problem Solving Skills*
  - *An ability to identify, analyze, and solve broadly-defined engineering technology problems*
- *PSLO 7 (ABET G) – Communication Skills*
  - *An ability to apply written, oral, and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature*

What was assessed? Student learning outcomes list:

- ***ISLO 1 - Communication Skills (Oral and Written)***
  - The category of communication skills requires students to demonstrate competency in both oral and written expression, including a basic understanding of discourse contexts and appropriate use of style and necessary writing technologies.
  - Oral
    - Students demonstrate or share knowledge to foster understanding, or to promote change in the listeners' attitudes, values, beliefs, or behaviors through a prepared, purposeful, communicative act.
  - Written
    - Students develop and express ideas in writing. This written communication typically involves learning to work in many genres and styles. It can also involve working with many different writing technologies, and mixing texts, data, and images.

What was assessed? Student learning outcomes list:

- ***ISLO 2 - Critical Thinking Skills***
  - The category of critical thinking requires students to demonstrate competency in formulating conclusions as a result of exploration, evaluation, and analysis. Students will explore, evaluate, and analyze objects, subjects, and phenomena.
  - Critical Analysis
    - Students demonstrate the ability to explore issues, ideas, artifacts, and events before accepting or formulating an opinion or conclusion.
  - Inquiry and Analysis
    - Students demonstrate the ability to organize complex topics to gain a better understanding of them (inquiry) while documenting and analyzing results as informed conclusions/judgments (analysis).
  - Problem Solving
    - Students design, evaluate, and possibly implement strategies to answer an open-ended question or achieve a desired goal.

Where were outcomes assessed?

- *PSLO 3 (ABET C) – Test and Measurement Skills*
  - *MECH242, MECH220*

- *PSLO 4 (ABET D) - Design Skills*
  - *MECH112, CONS272, MECH232*

- *PSLO 6 (ABET F) – Problem Solving Skills*
  - *MECH241, MECH232*

- *PSLO 7 (ABET G) – Communication Skills*
  - *ENGS101, MECH220, MECH242*

Where were outcomes assessed?

- *ISLO 1 - Communication Skills (Oral and Written)*
  - *MECH220, MECH242*
- *ISLO 2 - Critical Thinking Skills*
  - *MECH241, MECH232*

How was the assessment accomplished?

- Student work assessed:
  - Quizzes
  - Midterm and final exams
  - Oral presentations
  - Group projects
  - Term papers

- Measurement strategy:
  - Applicable rubrics used for oral presentations, term papers and group projects
  - % of questions answered correctly on quizzes and midterm/final exams
- Sample size:
  - All students who take the designated assessed courses, see attachment for N for each course

Assessment results: What have the data told us?

- ***PSLO 3 (ABET C) – Test and Measurement Skills***
  - *MECH242(F17*), *Students will work in teams of 4-5 to conduct an experiment and collect data. The data will be analyzed and a technical report written to industrial accepted standards by each student. The AACU Rubric will be used to evaluate.*
  - *70% of students will achieve 2 or higher on the AACU Rubric.*

  - ***FINDINGS:***
  - *Average Score: 3.77*
  - *Students showed a good capacity for conducting experiments and for interpreting experiments, however students were somewhat lacking in their capacity to fully analyze the experimental results. This largely has to do with their lack of comfort with the aforementioned engineering fundamentals and lack of mathematical exploration/reasoning.*

Assessment results: What have the data told us?

- **PSLO 3 (ABET C) – Test and Measurement Skills**
  - *MECH220(S17), Students demonstrate an understanding of standard testing procedures by measuring, collecting, and interpreting laboratory data such that it can be made useful in laboratory reports.*
  - *70% of students demonstrate 70% competence*
  - *This will be evaluated based on student's preparation of the lab 4 / lab 5 data and subsequent submission.*

  - *FINDINGS:*
  - *75% of students achieved greater than 70% competence.*
  - *100% of students demonstrated 70% or greater on the resubmissions.*
  - *More than 50% lack the ability to meet deadlines*

Assessment results: What have the data told us?

- ***PSLO 4 (ABET D) – System Design Skills***
  - ***MECH112 (S17***), *The ability of students to directly implement geometric dimensioning and tolerancing to engineering drawings will be measured by their performance on the portion of their late semester project requiring the application of GD&T. 70% of students demonstrate 70% competence*

  - ***FINDINGS:***

    72.6% of students (9 of 12 submitting) demonstrated 70% competence or better on GD&T assignment 7 which measured student ability to apply GD&T to a part drawing.

    Target Achievement: Met

Assessment results: What have the data told us?

- **PSLO 4 (ABET D) – System Design Skills**
  - *MECH232 (S17), Students can design a gear drive system. Assessed AACU Value Rubric for Critical Thinking. 70% of the students will score higher than 10 out of 20 on the AACU value rubric for Critical Thinking*

  FINDINGS:

  - *100% of the students scored greater than 10 out of 20 points.*

Assessment results: What have the data told us?

- ***PSLO 6 (ABET F) – Problem Solving Skills***

  – ***MECH241(F17)***, *Determine horsepower and efficiency of or pumps and fans. 70% of students will score 70% on question # 1 on the final project.*

  FINDINGS*: 77% scored 70% or higher. Target Achievement: Met*

Assessment results: What have the data told us?

- **PSLO 6 (ABET F) – Problem Solving Skills**
  - **MECH232(S17)**, *Methodically plan and design the solutions to fundamental machine element problems and present the solutions of a team project. Assessed AACU Value Rubric for Written Communications. 70% of the students will score higher than 10 out of 20 on the AACU value rubric for written communications*

  - *FINDINGS:*
  - *69% scored 10/20 or higher. The greatest contributor to low scores was only 62% adequately supported their work with quality sources and evidence to convince the reader. Target Achievement: **Not Met***

Assessment results: What have the data told us?

- ***PSLO 7 (ABET G) – Communication Skills***
  - ***ENGS101(F17**), Effectively present ideas and concepts to other engineers in an oral and written manner. Present findings from research into "engineering disaster" to the class orally and is supported by powerpoint. 75% of class will score 80% or better on the oral*

  FINDINGS:

  - *18 of 18 (100%) submitted acceptable powerpoints and delivered acceptable oral presentations. Target Achievement: **Exceeded***

Assessment results: What have the data told us?

- ***PSLO 7 (ABET G) – Communication Skills***
  - ***MECH242(F17***), *Pneumatic Test Stand_AACU Written Communications. Students will work in teams of 4-5 to conduct an experiment and collect data. The data will be analyzed and a technical report written to industrial accepted standards by each student. The AACU Rubric will be used to evaluate. 70% of students will achieve 2 or higher on the AACU Rubric.*

  FINDINGS:
  - *Average Score: 4.07*
  - *Students seemed generally comfortable with producing a good written lab report that was free of grammatical errors. They also demonstrated good usage of Excel for data collection and graphing. This is not surprising as many prior assignments in this class have been focused on critical writing and use of Excel.*

Assessment results: What have the data told us?

- **PSLO 7 (ABET G) – Communication Skills**
  - *MECH220(S17), Write laboratory reports that are clear, well organized, and professionally accepted in a timely manner. 70% of students demonstrate 70% competence*

  FINDINGS:

  - *11 of 19 students (58%) demonstrated 70% or greater competence on this assignment using the AAC&U Written Communication Value Rubric. There were 4 students who didn't submit anything. Taking this into account, 11 of 15 students (73%) demonstrated 70% or greater competence. Target Achievement: **Met***

  - Side note indicated that students can not meet deadlines

Assessment results: What have the data told us?

- ***ISLO 1 - Communication Skills (Oral and Written)***
  - ***MECH242(F17)**, Pneumatic Test Stand_AACU Written Communications. Students will work in teams of 4-5 to conduct an experiment and collect data. The data will be analyzed and a technical report written to industrial accepted standards by each student. The AACU Rubric will be used to evaluate. 70% of students will achieve 2 or higher on the AACU Rubric.*

  FINDINGS:
  - *Average Score: 4.07*
  - *Students seemed generally comfortable with producing a good written lab report that was free of grammatical errors. They also demonstrated good usage of Excel for data collection and graphing. This is not surprising as many prior assignments in this class have been focused on critical writing and use of Excel.*

Assessment results: What have the data told us?

- **ISLO 1 - Communication Skills (Oral and Written)**
  - **MECH220(S17**), Write laboratory reports that are clear, well organized, and professionally accepted in a timely manner. 70% of students demonstrate 70% competence

  FINDINGS:
  - 11 of 19 students (58%) demonstrated 70% or greater competence on this assignment using the AAC&U Written Communication Value Rubric. There were 4 students who didn't submit anything. Taking this into account, 11 of 15 students (73%) demonstrated 70% or greater competence. Target Achievement: **Met**
  - Side note indicated that students can not meet deadlines

Assessment results: What have the data told us?

- **_ISLO 2 - Critical Thinking Skills_**
  - **_MECH241(F17_**_), In the final project, the operating point is to be determine from an exhaust hood. 70% of students score 70% or higher._

  FINDINGS: _48% scored 70% or higher on the final rubric. Target Achievement:_ **_Not Met_**

  - **_MECH242(F17)_**_, Group sizes of 2-4 students will collectively design and select components required for a hydraulic log splitter. 70% of the students will score 2 or higher on the AACU Rubric for Critical Thinking._

  FINDINGS: _Overall Student Average: 2.81, Project Average (%): 70% Percentage of students with higher than 2.0 Average AACU overall Rubric Value: 93%. Target:_ **_MET_**

Data-driven decisions: How the program has or plans to "close the loop" based on these results.

- Continue to map courses and outcomes in Taskstream so the software can assist with this process better
- Revise CONS272 course outline to require a grade of C or better in CONS172
- Raise the standard and expectations from semester 1 across all faculty to hold students accountable for late assignments...(meet deadlines)

Data-driven decisions: How the program has or plans to "close the loop" based on these results.

- 3rd semester students (MECH242 assessment comments) are lacking in mathematical analytical capability stems from weak foundational learning in the student's respective engineering classes. I would suggest that students be instructed on the use of fundamental equations and to use mathematics as a means of exploring engineering problems in a more critical fashion – rather than just using an equation because they've been told to. This could be best implemented through the use of Project Based Learning (PBL) in foundational courses like statics, strengths of materials, intro to circuits, etc... Evaluation of this would link the following courses for in-depth analysis and potential for impacting change at this junction:

  ENGS101, MECH121, CONS172, PHYS121,122, 125, 126, MATH123, MATH161

What resources were used or have been requested to close the loop?

- MECH242 – Fluid Power Lab needs more hydraulic/pneumatic trainers. Enrollment has increased 3 fold in the program and this equipment needs to be updated. (cost estimated at $15-20K)

- Robotic software and equipment is limited to 1. We need to enhance and grow this sector in the program. Mechatronics and Electrical can benefit from this as well. (Cost TBD… not cheap $50-100K)

Attachments: 2017 SLO Findings

PSLO 3 (ABET C) – Test and Measurement Skills
Assessment Findings Data

PSLO 3 (ABET C) – Test and Measurement Skills

An ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes

	Measures	Not Met		MET		Exceeded		No Findings	
	N	N	%	N	%	N	%	N	%
All Courses	3			3	100				
MECH242	2			2	100				
MECH220	1			1	100				

PSLO 4 (ABET D) – System Design Skills
Assessment Findings Data

PSLO 4 (ABET D) – System Design Skills

An ability to design systems, components, or processes for broadly-defined engineering technology problems appropriate to program educational objectives

	Measures	Not Met		MET		Exceeded		No Findings	
	N	N	%	N	%	N	%	N	%
All Courses	1					1	100		
MECH112	1								
MECH232	1					1	100		

PSLO 6 (ABET F) – Problem Solving Skills
Assessment Findings Data

PSLO 6 (ABET F) – Problem Solving Skills

An ability to identify, analyze, and solve broadly-defined engineering technology problems

	Measures	Not Met		MET		Exceeded		No Findings	
	N	N	%	N	%	N	%	N	%
All Courses	1	1	100						
MECH241									
MECH232	1	1	100						

PSLO 7 (ABET G) – Communication Skills
Assessment Findings Data

Assessment Results - AACU VALUE Rubric for Communication (Written or Oral)

Subject	Course	Sections Participating	Total Sections	Outcome	Semester
MECH	220	1	1	*met*	Spring
MECH	232	1	1	*met*	Spring
MECH	241	1	1	*alignment not apparent*	Fall
MECH	242	2	2	*met*	Fall

Overall Findings for Communication

Total Sections Selected for Assessment	5
Total Sections Assessed	4
% Sections Meeting or Exceeding Target (of those assessed)	100%

Recommendations, Reflections, and Notes:

MECH 241: The lack of alignment isn't a huge problem. I just wasn't sure which course outcome was linked to the ISLO Communication. I did see the AACU for Critical Thinking though. Plan of Action: In the future just indicate which course outcome is linked to communication, or remove this course from the plan if it does not feature communication according to the AACU criteria.

MECH 242: (Holy cow! This level of detail is amazing!) **Faculty Recommendation -** The area that requires the most improvement is in the student's comfortability with using engineering concepts and mathematics to better explore, analyze, and justify their experimental findings. It would seem that this lack of mathematical analytical capability stems from weak foundational learning in the student's respective engineering classes. I would suggest that students be instructed on the use of fundamental equations and to use mathematics as a means of exploring engineering problems in a more critical fashion – rather than just using an equation because they've been told to. This could be best
implemented through the use of Project Based Learning (PBL) in foundational courses like statics, strengths of materials, intro to circuits, etc...

ISLO 1 - Communication Skills (Oral and Written)
Assessment Findings Data

Assessment Results - AACU VALUE Rubric for Communication (Written or Oral)

Subject	Course	Sections Participating	Total Sections	Outcome	Semester
MECH	220	1	1	*met*	Spring
MECH	232	1	1	*met*	Spring
MECH	241	1	1	*alignment not apparent*	Fall
MECH	242	2	2	*met*	Fall

Overall Findings for Communication

Total Sections Selected for Assessment	5
Total Sections Assessed	4
% Sections Meeting or Exceeding Target (of those assessed)	100%

Recommendations, Reflections, and Notes:

MECH 241: The lack of alignment isn't a huge problem. I just wasn't sure which course outcome was linked to the ISLO Communication. I did see the AACU for Critical Thinking though. Plan of Action: In the future just indicate which course outcome is linked to communication, or remove this course from the plan if it does not feature communication according to the AACU criteria.

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implemented through the use of Project Based Learning (PBL) in foundational courses like statics, strengths of materials, intro to circuits, etc...

ISLO 2 - *Critical Thinking Skills*
Assessment Findings Data

Assessment Results - AACU VALUE Rubric for Critical Thinking

Subject	Course	Sections Participating	Total Sections	Outcome	Semester
MECH	220	1	1	*met*	Spring
MECH	232	1	1	*exceeded*	Spring
MECH	241	1	1	*not met*	Fall
MECH	242	2	2	*met*	Fall

Overall Findings for Critical Thinking

Total Sections Selected for Assessment	5	
Total Sections Assessed	5	
% Sections Meeting or Exceeding Target (of those assessed)	80%	

Recommendations, Reflections, and Notes:

MECH 241: Recommendation from Faculty - Really get it into students head how to format excel and do it right. Also, make sure they do engineering format and provide final answers to double check excel

MECH 242: While I am providing this evaluation in an effort to assess my own class, I cannot understate the profound lack of fundamental understanding of physics and simple statics that was observed within this class. Additionally, the work ethic of the students is profoundly lacking. A great many students came into my class with some expectation that turning in late assignments was fine and also had pre-conceived notions that there would be re-do's on all of the presented material. I don't know where this behavior stems from, but as 2nd year undergraduate students, this is totally unacceptable and needs to be assessed and addressed.