AY 2025 Continuous Curriculum Improvement Summary

MAE Fall Retreat

8/19/2024

UtahStateUniversity®

MECHANICAL AND AEROSPACE ENGINEERING

Outline

1. Where we are in the Continuous Improvement Cycle.
2. Review of Course/SO Mapping and Assessment Tools.
3. Review of Mission Statement and PEOs.
4. Status update of previous open actions and recent data
5. Summary of AY24 data.
6. Looking Ahead to AY26 Reaccreditation Self-Study and Site Visit

CCIC Cycle Schedule

Activity	Cycle 1		Cycle 2		Cycle 3	
	AY21	AY22	AY23	AY24	AY25	AY26
Review of MS, PEOs, PIs	X		X		X	
Map educational strategies related to PIs	X				X	
Review mapping and identify where data will be collected	X				X	
Develop and/or review assessment methods used to assess PIs	X				X	
Collect data		X		X		X
Evaluate assessment data including processes		X		X		X
Report findings		X		X		X
Take action where necessary			X		X	

Student Outcome Course Map

Student Outcome	MAE 1010	ENGR 3080	MAE 3340	MAE 3420	MAE 3440	MAE 3600	MAE 4400	MAE 4800/4810
SO 1 Problem Solving				R	E			
SO 2 Design	I		R					E
SO 3 Communication		E					E	E
SO 4 Informed Judgment	I/R					E		E
SO 5 Teamwork	I		R					E
SO 6 Experiments			R				E	
SO 7 Lifelong Learning								E

Assessment Tools

- Instructor Course Assessments (SO 1-6)
- Graduating Student Survey
- Industrial Advisory Board (representing Alumni and Industry)
- Faculty Input – usually informal or discussions at Faculty Meetings
  - Considering using more formal surveys to solicit feedback about where students may be lacking from previous courses. Thoughts?
- Alumni and Industry Surveys – We have done these in an ad hoc fashion previously. Should we have a schedule and plan for sending out once or twice during each 6-year cycle? Thoughts?
  - These would be beneficial for ensuring we are engaging our constituents are involved.

Department Mission Statement

The Department of Mechanical and Aerospace Engineering provides each graduate with a foundation of knowledge and experience upon which to build successful careers in mechanical engineering, aerospace engineering, or other fields where a strong engineering background is required or desirable. Undergraduate programs emphasize mechanical engineering fundamentals and computer-based problem solving while teaching students to learn, synthesize, and communicate engineering information. Graduate programs emphasize research by the faculty with a high level of student involvement providing enhanced preparation for engineering practice, research, and education. Students, faculty, and staff are committed to excellence in learning, discovery, and engagement in an environment that fosters diversity and mutual respect.

Program Educational Objectives

1. Graduates will succeed in entry-level engineering positions with mechanical or aerospace firms in regional, national, or international industries, as well as with government agencies.

2. Graduates will succeed in the pursuit of advanced degrees in engineering or other fields where a solid foundation in mathematics, science, technology, and engineering fundamentals is required.

Current Open Improvement Actions

SO 2 (Design) AY 2023 Action

AY22 data showed below target in Design, specifically related to *defining requirements and constraints and identifying appropriate standards*

Action: Zac added more requirements to the midterm project in MAE 3340 to address this.

Result from AY24 data collection:

Performance Indicator	MAE 3340		MAE 4800/4810	
2.a	90%	4.3	100%	4.8
2.b	80%	3.5	80%	3.4
2.c	NA	NA	90%	4.2
2.d	NA	NA	80%	3.7

Student Self Assessments: 87% meeting with an average level of attainment of 3.4

(SO 2 Design) 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. (Target of 85% & 3.5)

a. Students produce clear and concise problem statements for design problems.
b. Students identify realistic requirements and constraints through consideration of appropriate professional standards; public health, safety, and welfare; and global, cultural, social, environmental, and economic factors.
c. Students develop multiple design alternatives and use requirements and constraints to evaluate acceptability and desirability in an objective fashion.
d. Students apply appropriate engineering principles to design and evaluate systems, components, and/or processes to manage risks while meeting design requirements and constraints.

SO 2 (Design) Summary

- Both the Instructor Course Assessments and Student Self-Assessments showed that students were not achieving our Target.
- This is the 2nd consecutive Data Collection Period where we have been below target.
- We are not assessing 2.c or 2.d in a 2nd course.
- This will remain an open action until additional data is collected showing that students are meeting our targets.
- What ideas do you have for how we can improve students' abilities in Design?

SO 4 (Informed Judgement) AY 2023 Action

AY22 data showed below target in Informed Judgement, specifically related to *understanding and evaluating ethical and professional dimensions by applying the ASME Code of Ethics of Engineers*

Action: Zac added more coverage of the ASME Code of Ethics in MAE 1010.

Result from AY24 data collection:

Performance Indicator	MAE 1010/4800		MAE 3600	
4.a	100%	4.4	100%	4.4
4.b	90%	4.5	100%	3.9

Student Self Assessments: 90% meeting with an average level of attainment of 3.7

(SO 4 Informed Judgment) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts. (Target of 85% & 3.5)

a. Students understand and evaluate ethical and professional dimensions in engineering situations by applying the ASME Code of Ethics of Engineers.

b. Students understand and evaluate the global and local impact engineering solutions have on the economy, the environment, and society.

SO 4 (Informed Judgement)

Data collection in AY 24 showed we were meeting our targets so we can consider this action closed.

SO 5 (Team Work) AY 2023 Action

AY22 data showed below target in Teamwork

Action: Zac added a team contract and planned to conduct peer reviews in MAE 3340 using the same peer review package being used in MAE 4800/4810.

Result from AY24 data collection:

Performance Indicator	MAE 3340		MAE 4800/4810	
5.a	97.4%	4.54	98.2%	4.35
5.b	95.2%	4.16	99.4%	4.41
5.c	97.4%	4.23	98.2%	4.38
5.d	98.2%	4.51	98.8%	4.36
5.e	98.2%	4.58	98.8%	4.37

Student Self Assessments: 93% meeting with an average level of attainment of 3.8

(SO 5 Team Work) 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. (Target of 85% & 3.5)

a. Students contribute to the team's work to achieve its goals by completing the assigned tasks.
b. Students interact with teammates by providing positive interactions withing the team that contribute to a supportive environment.
c. Students keep the Team on track by making efforts toward achieving the team's goals.
d. Students express belief that the team is capable of quality work and encourages the team to strive for quality.
e. Students have or learn the necessary knowledge, skills, and abilities for their assigned tasks and can perform other roles if needed.

SO 5 (Team Work)

Data collection in AY 24 showed we were meeting our targets so we can consider this action closed.

SO 6 (Experiments) AY 2023 Action

AY22 data showed below target in Experiments, specifically relating to *developing appropriate experimental procedures for obtaining measurements of a desired variable* and *comparing experimental results with appropriate models, explaining the differences between experimental and model results, including measurement uncertainty, and developing meaningful conclusions*

Action: Zac revised the lab writeups that requires students approach the problem from a customers' viewpoint with emphasis being placed on the purpose and results/findings as opposed to just reproducing the lab experiment and plotting the data

SO 6 (Experiments) AY 2023 Action

Result from AY24 data collection:

Performance Indicator	MAE 3340		MAE 4400	
6.a	100%	4.2	100%	3.9
6.b	90%	3.9	100%	4
6.c	90%	3.8	90%	3.9

Student Self Assessments: 91% meeting with an average level of attainment of 3.7

(SO 6 Experiments) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. (Target of 85% & 3.5)

a. Students develop appropriate experimental procedures for obtaining measurements of a desired variable.
b. Students conduct experiments by following experimental procedures and operating instrumentation in a manner appropriate for the required accuracy.
c. Students compare experimental results with appropriate models; explain differences between experimental results and model results, including measurement uncertainty; and develop meaningful conclusions.

SO 6 (Experiments) AY 2023 Action

Data collection in AY 24 showed we were meeting our targets so we can consider this action closed.

SO 7 (Lifelong Learning) AY 2023 Action

In AY23 we voted to replace the Instructor Course Assessments of SO 7 with specific questions from the Graduating Student Survey.

Action: Changed our Assessment Method

Result from AY24 data collection:

Performance Indicator	Graduate Survey
7a. Graduate/Professional School Plans	44%
7.b Professional Licensure Plans	53%
7.c Student Organization Membership	43%
7.d Professional Organization Membership or Plans	33%
7.e Undergraduate Research Participation	26%

Student Self Assessments: 96% meeting with an average level of attainment of 3.9

(SO 7 Lifelong Learning) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies. (Target of 30%)

a. Students plan to attend graduate or professional school.
b. Students plan to pursue professional licensure.
c. Students have been a member of a student organization.
d. Students are or plan to be a member of a professional society.
e. Students have participated in undergraduate research.

SO 7 (Lifelong Learning)

- Data collection in AY 24 showed we were below our target of 30% participation in undergraduate research.
- This will remain an open action until we meet our target value.
- Is 30% what we think this should be?
- Should we also include other categories, like independent projects, in this category?

AY 2024 Assessment Data

SO 1 (Problem Solving) AY 24 Data

Instructor Course Assessment:

Performance Indicator	MAE 3420		MAE 3440	
1.a	100	4.5	70%	3.4
1.b	100	3.75	70%	3.2
1.c	75	3.5	50%	2.7

Student Self Assessments: 93% meeting with an average level of attainment of 3.7

(SO 1 Problem Solving) an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. (Target of 85% & 3.5)

a. Students interpret given information and correctly identify the problem to be solved.
b. Students apply scientific and engineering principles that are appropriate for the required accuracy to formulate mathematical models of systems and/or processes.
c. Students apply mathematical principles to obtain analytical or numerical solutions of mathematical models with the required accuracy, including the use of computer-based tools.

SO 1 (Problem Solving)

- Data collection in AY 24 showed we were below our target of 85% and 3.5 for multiple performance indicators.
- This has been an area where faculty have expressed concern wrt student abilities but has not shown up in data collection previously.
- Our consideration of the “Complex Engineering Problems” has better clarified what our expectation is of students.
- Are fundamentals courses, like Fluids and Heat Transfer, appropriate for requiring and assessing students’ abilities to solve Complex Engineering Problems?
- *Computer-based* is mentioned in our Mission Statement and in PI 1.c, but we don’t require students use Computer-Based Tools.
- Ideas?

SO 3 (Communication) AY 24 Data

Instructor Course Assessment:

Performance Indicator	ENGR 3080		MAE 4400	
3.a	70%	3	100%	4.6
3.b	70%	3.4	NA	NA

Student Self Assessments: 95% meeting with an average level of attainment of 3.8

(SO 3 Communication) an ability to communicate effectively with a range of audiences. (Target of 85% & 3.5)

a. Students write effectively on engineering topics using a format, including producing clear, complete, and accurate figures and tables, and a level of detail that is appropriate for both managerial and/or technical audiences.
b. Students prepare and give effective oral presentations on engineering topics using a format, including producing clear, complete, and accurate figures and tables, and level of detail that is appropriate for both managerial and/or technical audiences.

SO 3 (Communication)

- Data collection in AY 24 showed we were below our target of 85% and 3.5 for written and oral communication.
- This has been a common area of criticism from faculty and a point of emphasis from our IAB.
- Do we used consistent writing standards across the curriculum?
- Are we taking advantage of the Engineering Writing Center – having requirements in all courses that involve writing?
- Also, we are not assessing oral communication outside of ENGR 3080.
  - Would it be possible to add this into MAE 4800/4810?
  - I envision this could be done via survey/evaulation by the “customer” during the PDR and/or CDR

Looking forward to our AY26 Reaccreditation Review

2026 Reaccreditation Timeline

- Self-Study Report will be due July 1, 2026 and will include our assessment and continuous improvement efforts through AY26.
- Site Visit will take place Fall 2026.

Miscellaneous ABET Information

- I will likely ask you keep all AY26 Course Documents but ABET no longer requires extensive materials. If you teach a Data Collection Course, I will ask you to keep your Samples that were used for the Assessments as well as all other student work if asked to see it.
- Team-Based assignments are acceptable for assessments. (We have been using this approach in multiple areas)
- Assessments should be conducted frequently enough to assess every outcome for every student cohort. (We do this already)
- Most common shortcoming: Assessment/Evaluations not being used as inputs for Continuous Improvement. (We are good at this)