

Richard and Elizabeth Henes Endowed Professorship

FY-2024 Annual Report

submitted by

William J. Endres, Ph.D.

Dept. of Mechanical Engineering – Engineering Mechanics
College of Engineering
Michigan Technological University
1400 Townsend Drive
Houghton, Michigan 49931-1295



This report summarizes initiatives and related activities during FY-2024 supported and/or inspired by the Richard and Elizabeth Henes Endowed Professorship. I am grateful to the Henes family for their support that aligns with my passion for education program development that instills in our graduates a growing mindset in the areas of commercial engineering practice and leadership. Coupled with my serial entrepreneurial background, authorship of professional development books in commercialization engineering and leadership practice, and recent founding of a leader development business focused on young adults, it is my intent to use the endowment-provided resources to explore, conceive, develop, and deliver adoptable value within the ME-EM and MTU curricula, always focusing on differentiating MTU in the higher education market.

Picking up from last year, the graduate capstone experience is no longer being pursued based on market feedback previously discussed. Most of the work this year has focused on testing the Capstone Design Program operations system, migrated from *Microsoft Office* last year, in preparation for the next stage of its development, and gradually expanding the leader development series (LDS). These are elaborated upon here.

1 Leader Development Series

1.1 Overview

I will begin by repeating for any new readers some background from last year's report. As part of my entrepreneurial work outside the university, in Spring 2020 I began exploring the potential market for young-adult leader development to prepare future leaders with non-buzzword leadership knowledge, both principles and experiential, not theoretical. I then developed a plan for what a business might look like and, in Fall 2020, initiated stakeholder discovery. With validation of the need and value potential, pilot offerings commenced in May, 2022. With very positive participant response, Evolvent Leader Development, LLC (ELD) was formalized in Spring 2023. I mention this here because, like all my entrepreneurial endeavors, I seek mutual benefit for MTU. A first step in that regard was piloting a for-credit version of the first in the series in Spring and Summer 2023, with ELD providing the content compilation and operations management. That MTU pilot engaged seven final-semester undergrads I identified from their outstanding work in their first semester of senior capstone design (SCD1) and five graduate students whose advisors supported their involvement. With twelve students completing "season" 1 (of the nine-season sequence planned, each season being a one-credit course), the story continues below with commencement of FY-2024; please refer to §1 of my FY-2023 report as desired for the rationale and other details of the series in general.

1.2 Activities

Scaling the for-credit course series will require engaging practicing or retired managers from engineering industry to serve as guides (instructors) for one or more "peer-groups" each; I am serving that role in these early pilot and testing stages. Partnering with ELD enables these future instructors to focus on where he/she brings value — interaction with the students — by relegating to ELD the "other work" of content compilation, scheduling and calendar management, and weekly emailing of thinking and reading prompts. This year has been focused on laying the MTU-internal groundwork so that we will be ready to enlist our first one or two external guides on a trial basis in AY24-25.

In regard to scaling the recruitment of students, I devised a plan to evolve from where I started: me inviting students I observe favorably SCD1 to take a single season during SCD2 after which they graduate. For the Fall-2023 class, we began identifying and inviting ME-EM students when they are in ME Practice 3 (MEP3) so they can take up to three seasons of the series while in MEP4 and the two semesters of their capstone design experience, whether in the department (SCD1 and SCD2) or in an enterprise. This would allow students to gather one semester of a different viewpoint of leadership prior to engaging their capstone team and project. For SCD1 and SCD2, the intent is not that they become the formal leader of their team, rather it is to increase the population of students in these courses who are starting to think differently in regard to leading and following/teaming. For those students doing their capstone experience in enterprise, the intent is to provide the same start to different thinking to those who will, in fact, be leading others as “sub-team leads” or other formal lead roles. The recruitment mechanism in ME-EM was trialed and is now in place after two uses. Nominations come from select colleagues who see students in their late second and early third year classes. Their charge is to review the MEP3 roster and nominate those students they would consider “top performing, high potential” **not only by grades, but also** by exhibiting such characteristics in spite of grades that may not be at the very top.

In addition to the above groundwork activities, other groundwork activities include the following:

- Thus far and into AY24-25, the LDS courses have been run as special topics courses (MEEM4990 and MEEM 5990). This year, learning objectives have been developed and full course-creation paperwork packages are complete for the first six seasons/courses. The final three of the intended nine courses will wait until we gather more data in regard to continued interest in students beyond the first six courses. The course-creation paperwork packages, now with assigned course numbers, are ready to be submitted in the next binder process in Fall 2024.
- Approval for BSME students in the Enterprise Concentration to use two LDS courses to fulfil the concentration requirement to take two credits of Enterprise modules (generally non-technical, these are one-credit courses available across the university).
- The first three courses are now fully implemented into Canvas (learning management system) masters. There is one master for each of fall, spring, and summer terms designed for ease of setup across potentially six or more simultaneously running seasons/courses. This approach to design yields no need for shifting of dates to accommodate break movements from fall to spring to summer (no breaks), which is quite time consuming and error-prone for a single course much less six or someday up to nine.
- The approach and content for the midterm and final are conceived, implemented, and refined with rubrics for the first three seasons/courses. The approach is a short presentation to their peers, outlined and written out in “speakified” form, practiced, then delivered using only the outline and no slides. The first two are done around scenarios where they are aiming to inspire study of leadership in the audience they address, which ranges from co-workers to new-hires. The season-3 midterm and finals remove the scenario but retain the no-slides, outlined, written, then delivered approach. The same is being continued for season 4 where at the time of this writing they have been conceived and implemented for assessment during/after the summer offering.

In closing of this focus area of effort, the following documents the participation thus far:

- Students 10 – 12 completed season 1 in the Summer-2023 term with continued highly favorable feedback. All three wanted to continue though the two undergrads were graduating and could not at this time.
- The non-credit peer-group of four younger colleagues that began season 1 in Summer 2023 completed it and all continued into season 2 in the fall, season 3 in the spring, and are into season 4 this summer.
- The five graduate students (four from Spring 2023 and one from Summer 2023 season 1) continued into season 2 in the fall, season 3 in the spring, and are into season 4 this summer. In fact, three of the five in the summer continued in a non-credit manner in spite of changes in their academic standing (one graduated in the spring, the other defending in the summer).
- The offering to undergraduates expanded, now inviting them from the MEP3 roster, as noted, as well as some students entering SCD2 (as done in Spring and Summer 2023), as follows:
 - In Fall 2023, 12 commenced season 1 with four continuing to season 2 in spring 2024 (two opted not to continue, the others graduated or went on co-op).
 - In Spring 2024, 16 commenced season 1, now, in addition to the invitations from the MEP roster process, invitations sent by way of two enterprise advisors, with the following breakdown:
 - Two of two nominated by the SAE Baja advisor accepted and joined.
 - One of three nominated by the Built-World Enterprise advisor accepted and joined.
 - Twelve of 24 MEP3 nominees joined.
 - One of one SCD2 nominees joined.
 - Looking ahead to Fall 2024 (recruitment process taking place in Spring 2024 and early summer), I added to the process peer-consultations for enterprise nominations. I engaged one of the season-2 participants who is on the Formula SAE enterprise (originally nominated from the first MEP3 roster), and the two season-1 Baja enterprise students if they would consider nominating teammates they saw as potential future sub-team leads. They enthusiastically did so and **at this point** the Fall-2024 projected participation is as follows (11 total; the spring MEP3 class is about half the size of the fall MEP3 class):
 - Five of eight nominated by the Baja students and advisor accepted the invitation.
 - Two of six nominated by the FSAE student accepted the invitation (one needs to delay to Spring 2024 due to an 18 course-credit limitation).
 - Four of 15 MEP3 nominees have accepted the invitation.
 - One of one SCD2 nominees has accepted the invitation.
- Based on the experience of the four colleagues now in season 4, five other younger colleagues, invited by the ME-EM department chair, expressed interest to form another non-credit peer-group to start this summer, but scheduling conflicts have delayed that until fall 2024. For this and the other colleague group, the Evolvent services package is donated as my personal desire to invest in younger colleagues who are the future of the

department; my time as their peer-group guide is covered by the funds from this endowment.

2 Capstone Design Program Operations Management Platform

The ME-EM Senior Capstone Design (SCD) Program has as many as 200 students per year working on 30 – 40 projects under the advising team of 8 – 10 individuals and with the participation of more than 70 others as design review panelists. With two cohorts — fall-spring and spring-fall — overlapping, and at this scale, smooth operation that does not inhibit student progress and allows students to focus on high-value activities requires more than a “human running it in manual mode.” The challenge of operating the program, and thus the value of this initiative, is expected to increase by 25% (to 250 students, 50 projects, etc.) by AY28-29 with the AY25-26 launch of a new BS degree in Aerospace Engineering within the ME-EM department, which will be renamed later this summer as the Department of Mechanical and Aerospace Engineering.

In FY-2023, this major initiative was begun, migrating the decade-old *Excel*-based operations management platform to *Google Sheets* and *Google Workspace*, with *Google* script replacing *Microsoft* VBA in the coded backend. Having put the results of those developments to the test over the course of FY-2024, the next steps have been planned and initial design methods drafted toward the final goal of being far better than its predecessor with greater automation, flexibility, integration, robustness, and consistency. As noted last year, this will allow the program director, me now and my successor in the future, to focus less on keeping up with operational checkboxes and more on higher-value activities engaging the students and the advising team, while also facilitating noted expansion of the program with no net increase in program director workload. Outcomes from that plan center mainly on automating communications to teams, maintaining the various program calendars, and integrating event scheduling with import of team class conflict periods, including the following:

- auto sending of emails, removing about 100 templates from Canvas and the manual copy-paste sending of them;
- automatic generation of the Advising-Team *Google Calendar* meeting/design-review attendance placeholders and grading events with embedded resource links, and all program-director calendared tasks, all of which have previously been generated and resource-linked manually each semester; and
- transition of the team scheduler *Excel* tool for event scheduling for the whole process, from importing from academic advisors the ASPIRE data on teams to gathering Advising-Team and student-athlete time availabilities to creating event schedules, to *Google Workspace* with the addition of direct integration with *Google Calendar* and *Gmail* for sending notices to teams.

Unrelated to the management platform, but major advancements in the SCD program include:

- The extensive Doc-Prep Guidance and Work-Product Guidance systems were migrated from a now defunct MTU legacy web-pages system to a Canvas course, including significant refinements in the process.
- I piloted with one team a summer offering of MEEM4911 (SCD2) toward the potential for a future regular summer offering, to a small number of teams, allowing them to complete their spring-started project. This is being considered at this point for a regular course number and offering to the benefit of students who have only SCD2 to otherwise

complete on campus in the fall semester, greatly reducing the financial burden that comes with living accommodations for one more semester and lost employment income that could otherwise commence four months sooner with the summer SCD2 completion.

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