Memo rev August 5, 2025

ETID Department at Texas A&M
MXET Laboratories
By David Malawey
Technical Laboratory Coordinator

To ETID Department Head Dr. Bimal Nepal,

This memo was prompted by feedback from our students in ETID with a culminating type of concern you might consider a clear failure following persistent negligence in education. Our students arrive in ETID with an opportunity to gain a functional skillset in robotics and industrial automation but even our top graduates are lacking fundamental expertise in automated systems at this time. With electronics and mechanical academicians under one roof, we have the capacity to make a correction and correction is imperative. On May 30, 2025 I published a video on YouTube titled We (USA) need to catch up with the Developing World in Engineering wherein I explained that our Texas A&M student outcomes have fallen short of student outcomes in Malaysia using the same robotics curriculum. This letter offers substantive explanations for my above story, and more details from the past decade in our department.

Background

The MXET program in ETID offers a *defining course* where students can implement and understand control systems and *that course is Mobile Robotics*. The course itself was designed in conjunction with the lab equipment, lessons, and exercises as a unified offering that teaches a control system as a module including a wheel, motor, sensor, and motor controller. That module is duplicated and formed into a system, where the movement of the robot is defined by the engineer, and all of our lessons work through all of the mechanisms. I led the development of each of this robotic system and I authored most of the materials for the course.

The course which was originally designed by myself and Dr. Morgan was refined multiple times and carefully handed off to a faculty who took ownership of the course. But after several semesters, we can find the student semester projects becoming less successful and direct discussion with students is showing me they have not gained the relevant and necessary lessons to succeed. Furthermore, we have clear evidence that the training of students has been reduced in scope and intensity and it's also clear where each learning target has been omitted or atrophied.

Lab System Overview

The laboratory system for this course is a mobile robot called SCUTTLE with two speed-controlled wheels. Each wheel module begins with software that defines a power level that drives a motor and results in position and time increments for the rotating pulley. To control the motion of the robot our students must be able to compute the speed of each wheel. But, this summer I've interviewed a student very carefully on the subject and he reported that there was no lecture nor lab exercise nor slide which informed on how to compute the wheel's speed.

Importance of Mobile Robotics

Let us establish the purpose of the mobile robotics course. The decisions underlying the Mobile Robotics laboratory, combined with the lectures, selection of content, lab equipment and robotics topics were seen at the time as a defining set of choices for the MXET program, while MXET was seen as a defining new landmark for ETID. Even if our higher faculty were unaware, the authors of the program saw their content in such a way.

Multidisciplinary engineering education relies invariably on a watertight answer to the question around its' purpose and to avoid the dangerous situation of graduating students with a blended but incohesive knowledgebase, which I believe we now yield (as of Spring 2025) from our Department. The definition of the program is the uniqueness of the education and that uniqueness was built into the curriculum we have degraded.

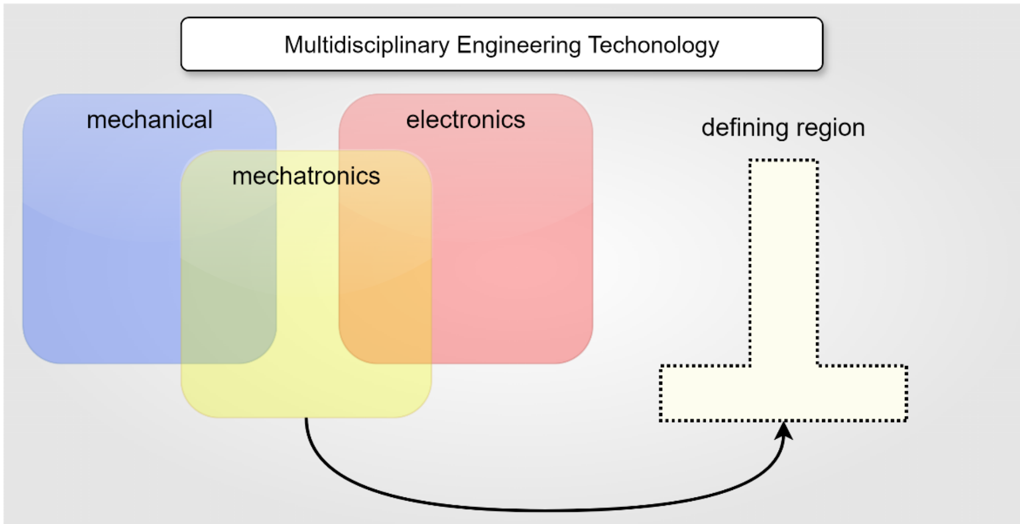

Figure 1: The defining region of a mechatronics degree program

In the most refined possible sense, what is the purpose of multidisciplinary engineering? The answer must also withstand: *What is the job that is impossible to perform without a multidisciplinary engineering degree?* A proper answer focuses on the engineering of *systems*. Not a circuit board, not a mechanical assembly, but the engineering of configuring an amalgamated system which makes subsystems to work together. Therefore, the **MXET curriculum must be centered on systems engineering**. Otherwise, it achieves only a less-equipped variety of an expert from the Electronics or Mechanical subject areas. For this discussion let us refer to the graduates of Electronics or Mechanical engineering as the ODE, or One Discipline Expert. Note in Figure 1, the defining region is where the mobile robotics course resides. It is the first and only opportunity for MXET students to master a whole system and therefore the only curriculum populating the defining region.

How can we produce competence in mechatronics systems and measure if the target is met? Only by:

1. Offering exercises with system engineering outcomes.
2. Teaching that which yields success in making a system function
3. Including targets for system engineering which cannot be executed by the ODE
4. Examining the learner's capability for the engineering target in (3)
5. Adapting our lectures & labs until examinations indicate success.

For the reasoning indicated in the above list, our Program Director led the MXET formation and recruited my efforts based on my systems-engineering experience. From 2016 I was tasked with building the curriculum for mobile robotics and I considered this the most important output of my career at Texas A&M, or possibly of my life.
Two key elements posed the greatest challenges. First, the students had an evolving set of prerequisite knowledge as the MXET program was being defined in real-time. Also the students evolved in realtime, where students arrived in the course from ESET, MXET, and MMET at varying rates. This diversified my audience which demanded a strenuous effort at making the content a catch-all for preliminary knowledge. Concurrently, the level of basic coding skills varied widely because freshman engineering courses made massive shifts on the students' exposure to software. This challenge translated into an extremely calculated set of course instructions

that would be made to eliminate dozens of possible learning gaps where students of eclectic background levels could capture knowledge in every severe gap area and make an intense step towards a truly capable mechatronics engineer in just one course.

At the start of the semester, I collected a survey of student skill experience and I administered the lab in a customized way for precisely the student group at-hand.

Last Name	Python (syntax,	Linux (command	Kinematics (calculating	Mechanical assemblies	Digital Sensors (communicati	Power Electronics	Internet of things	3D Printing (CAD	Prefer to be Team	TOTAL
	0.8	0.6	1.3	1.3	1.0	1.3	0.5	0.9		7.6
Travis	1	0	1	1	1	1	1	1		7.0
Bowen	1	2	1	1	2	1	2	0	Hardware	10.0
Roa	1	1	2	2	1	2	0	1	Software	10.0
Quireza	0	0	1	1	0	0	0	1	hardware	3.0
Mullen	1	0	1	1	1	2	0	0	Software	6.0
Rosart-Brodn	0	2	2	2	1.5	2	0	2	Hardware	11.5
Divers	2	2	1	0	2	2	1	0	Software	10.0
Boswell	0	0	1	1	1	1	1	0	Hardware	5.0
Traeger	1	0	1	2	1	1	0	1	Software	7.0
Davila	1	0	2	2	0	2	0	2	Hardware	9.0
Heibel	0	0	2	2	1	1	1	1		8.0
Reinhardt	1	0	0	1	0	1	0	2	Hardware	5.0
Tommy	0	0	1	1	1	1	0	1	Hardware	5.0
Trapp	0	0	2	2	1	1	0	2	Hardware	8.0
Palthe	0	1	2	2	0	1	0	1	Hardware	7.0

Figure 2 Evaluation of Students at Start-of-semester

Figure 1 shows an example of the student survey that was used in fall of 2019 for academic refinement of the lab. It is an example of an acceptable level of effort in postsecondary education. Team pairing was refined to make skillsets more complete. Average classroom background knowledge was measured to then lecture on the weaker topics. I gave lectures at the start of each lab meeting to open the topic, extracting the knowledge level of the present students through questions, and filling gaps in understanding with verbal and whiteboard-written information that would answer questions to occur during the lab exercises. My mini-lectures at the start of the labs, at that stage, delivered crucial engineering points that ideally would be delivered in the lecture meetings. The lecture content offered by the professor was incomplete for students to begin their labs so my effort was necessary. I expected in the coming semesters, these professor’s lectures would be updated to render them complete for student success.

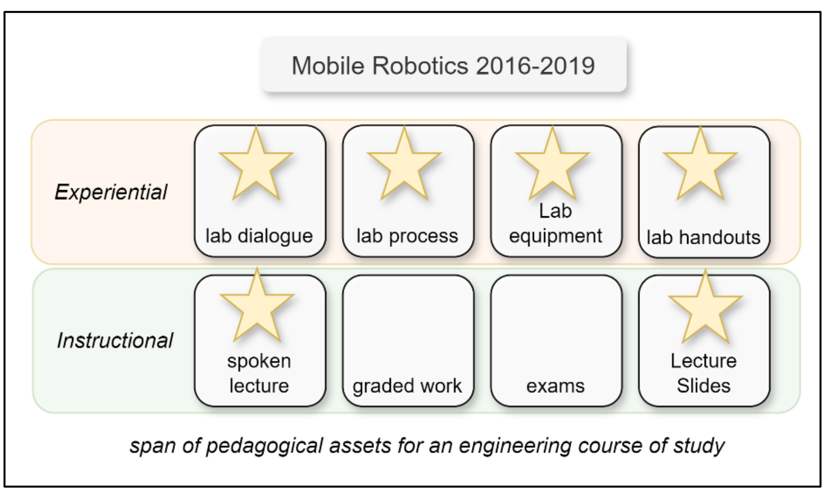

Figure 3 Teaching Pathways met with 75% coverage

When we onboarded a new faculty in MXET this professor came from a pure mechanical engineering background with no familiarity with electronics. This posed a risk. It forced a very heavy training requirement between myself and the teaching assistant for the initial two semesters. Having a professor without electronics experience placed severe risks the curriculum could not be transmitted to the next set of students. I responded by formulating mini-lectures at the start of each lab. The curriculum could still be effective only if the teaching assistant was able to deliver an equivalent level of lecturing as I had offered.

It was naturally expected that the new professor would learn over the following two or more semesters enough about the laboratory to integrate its topics in the lectures, and be able to make decisions about the lab curriculum to enhance the success of the students. However, the professor has not studied the materials, understood the labs from the 2019, understood the instruction set, nor practiced the exercises to teach them. In 2020 our well-trained senior level student(s) were recruited into the teaching assistant position(s) to continue instruction at a fair level but they have since graduated and the skillset has fallen drastically in the educational team altogether.

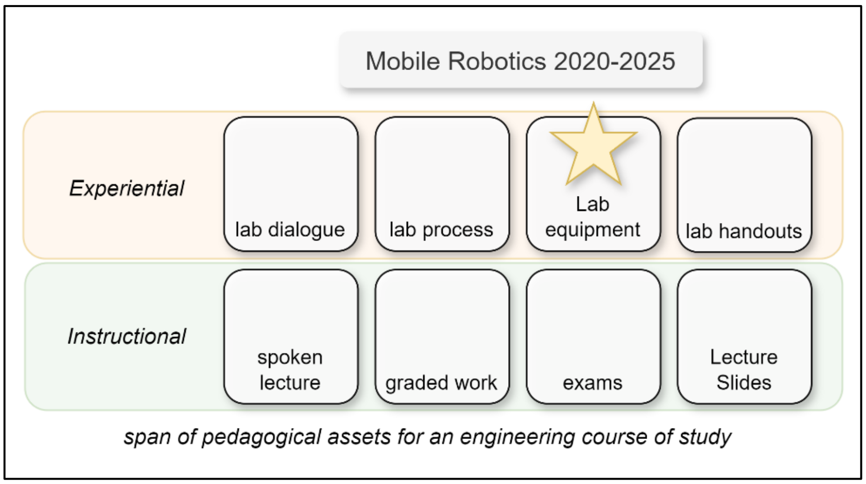

Figure 4 Teaching pathways reduced to 12.5% coverage

The lessons which are mentioned in the above paragraphs were, as of 2020, delivered to students in several parallel pathways. Each square box in Figure 3 and 4 are pathways for the education to reach the students and each star indicates where a pathway was equipped with key learning elements. For example, control of wheel speed: This knowledge was discussed in lab dialogue, embedded in the lab process, supplemented with lab handouts, and appeared in lecture pathways (indicated by the lower four boxes). At a later stage (ie 2021) there was no longer any graded work for the students to show they could implement control of a wheel speed. And having a new-generation teaching assistant, our TA could no longer verbally discuss the wheel speed during in-person lab instruction. Gradually, our key lessons have gone missing from the curriculum across most pathways and remain only as a passive learning opportunity because the lab equipment supports it.

Even if there is not a direct lecture on a given topic, or even if the lab exercise does not pace learners through topics, it is still possible to make available the lesson content through handouts and graphical instructions. Between 2020 and today I enhanced nearly all of the written guides that document our instructions for most laboratory tasks. That means the self-motivated students still have the opportunity to learn the key lessons, through self-study and independent practice. For example, my set of slides called “Kinematics Guide” details nearly all the necessary instruction to achieve accurate motion control of the robot. It describes the software variables in code, the kinematics measurements on the lab equipment (robots), and the mathematics to convert wheel speeds over to chassis speeds by kinematics computations. These documents authored by myself would give us a star on figure 3 under “lab handouts.” But instead,

Between 2020 and 2025 I detected the students missing key learning pathways and I continually enhanced the documentation which would answer the questions of students. I obtained knowledge of the students questions and learning gaps by visiting their team work meetings in Thompson hall where students build their final project for Mobile Robotics and their senior design projects which sometimes are built on top of a SCUTTLE

Robot. I made this content available at www.scuttlerobot.org/resources and each time I visited the lab space I would meet the current Teaching Assistant and show him the powerpoint slides, webpages, and github repositories to bring this information to the students. In the meantime, the professor of the course evidently made no effort to share this information with the students through email or lecture.

Here is an important disclosure for my audience: When someone possesses deep, hands-on experience in applied robotics engineering, they can enter a room where multiple student projects are underway, quickly scan the tools and materials in use, and within seconds form a clear mental picture of what has been omitted from the curriculum in the preceding year. Over the past several years, I was not involved in the delivery of the MXET mobile robotics course; however, I continued to make periodic observations and visited the classrooms where students conducted their lab activities and semester projects. From these visits, it became clear that significant changes had occurred—changes that reflected a noticeable reduction in both the scope and instructional quality compared to earlier years.

Changes Since 2019

The following changes have been observed since the fall semester of 2019 in our mobile robotics course:

1) The assembly of the robot was eliminated from the course lab. The students lose the opportunity to:
    a. Understand how the belt system is configured between motor and wheel pulleys
    b. Understand the gear ratio of the belt system and the computation of kinematic movements from the gear ratio.
    c. Align the chassis beams for flatness, which in turn aligns the wheels to rest flat on the floor and cause a predictable contact points and reliable kinematics.
    d. Build Dupont cables, learn to perform tug tests, learn to probe the assembled cables while they are attached to the sensors and gain the capability of troubleshooting the communications between processor and sensor.
    e. Solder the encoder circuit boards, reading the wiring diagram and configuring the pins on the encoder sensor to assign the desired i2c addresses to left-hand and right-hand motors, which in turn gives access in the software for students to sample from left-hand and right-hand sensors on-demand.
    f. Gain familiarity with the fasteners on the robot, and capability to tighten chassis components without damaging the 3D printed components.
    g. Note: nearly all of items a) through f) learning outcomes had been designed to directly feed into the success of our capstone projects, where over 60% of the student teams attempt projects that utilize this knowledge. The intended learning during Junior year is then transferred into the senior year during the final portion of student efforts, without direct instruction and without any systematic accommodation of the instruction. The mechatronics student design outcomes have demonstrated a measurable decrease in functionality and design of robust assemblies.
2) The lab instruction has eliminated the lab where distance, speed, and time are measured and correlated. Students lose the opportunity to:
    a. Understand and manipulate the software which defines the robots wheel speed,
    b. Verify wheel speeds independently and ground speed of the robot.
    c. Test and verify a simple software module that predicts and commands the robot to advance and stop for a specified distance.
    d. Measure the deviation of a target distance and resulting driven distance after command execution.
3) The lab instruction removed an exercise that demonstrated a complete motion control program integrating computer vision. This program enabled the robot to detect an orange basketball using a USB camera and process the image through a Python-based algorithm to estimate the ball's position. The system compared the ball's on-screen horizontal position to the robot's left/right navigation paths and used the apparent size of the ball to estimate its distance. This estimated distance was then compared to

a target setpoint. Based on these comparisons, the robot executed movements—advancing, reversing, and turning—to continuously track the ball and maintain an orientation facing it from a distance of 0.5 meters. The students lost:

   a. A working exercise for autonomous navigation
   b. An understanding of field-of-view as it relates to the robot's motion
   c. Ability to adjust the camera or sensor position on the robot for the best information gathering.
   d. A realiable mathematical model for converting vision-space in pixels to 2D ranging values suitable for robot movement.

4) Several additional elements from the original 2019 lab and lecture materials have been omitted, resulting in the loss of key learning objectives that directly support the development of core robotics competencies among students.

As of June 2025, I conducted a detailed interview with a student concerning a fundamental concept in the mobile robotics course. This student had the highest level of exposure to the SCUTTLE educational robot, having worked with it during the MXET 300 course and across two semesters of senior design. Our discussion focused on controlling wheel speed—a topic that was neither covered in lecture nor addressed in lab exercises. The gear ratio of the platform was not explained in class, and students were never tasked with computing or controlling wheel speed. Furthermore, the reference material containing essential diagrams, parameter values, and equations for wheel speed were never provided. Although comprehensive PDF guides—freely available to the public—exist, they were not shared with the class, and students were not made aware of their availability. As a result, dozens of students encountered avoidable challenges, despite the existence of high-quality instructional resources specifically developed for this platform.

It is not possible to define a more minimal effort on behalf of the professor beyond simply sharing a hyperlink full of resources for the students, and this minimal effort is being presently neglected. The corresponding lost learning, wasted time, stress on the individual students, and eventual hindrances to their success in their engineering projects has not been measured but it has been observed and it is blatant. But if we wish to see an image of these losses, you can refer to my video indicated in the first paragraph and you can see visually what an immense success was made possible with a minimal effort in education. To repeat a key point "we had a four-year head start at Texas A&M and used the same curriculum in Malaysia, only to see Malaysian students surpass the Texas students." We effectively have a case study compiled in high definition video depicting students of a developing country with fewer resources and less renowned universities who are greatly exceeding the present-day outcomes our students are attaining.

Questions:

- What is the clear definition of multidisciplinary engineering technology which our department has committed to teaching, and does it differ from the description written herein?
- For what reason has it been decided to eliminate learning outcomes I've described in MXET?
- What efforts have been made to uphold quality education and where is the evidence recorded?
- How do the faculty demonstrate alignment with the MXET mission and how has that mission changed since 2018?
- Which institutions, and what programs in those institutions, does ETID evaluate as benchmarks in our pursuit of national recognition, as noted in our Mission Statement?
- If these are not the right questions to ask, what questions should be asked based on the information provided in total?

Sincerely,

David Malawey

Attachment: reprimand letter for my voicing of opinions in public.

DEPARTMENT OF ENGINEERING TECHNOLOGY
& INDUSTRIAL DISTRIBUTION

TEXAS A&M UNIVERSITY

MEMORANDUM

TO: Mr. David Malawey, Laboratory Coordinator III

FROM: Dr. Bimal Nepal, J.R. Thompson Chair and Department Head

DATE: June 12, 2025

SUBJECT: Reprimand

This communication serves as a formal reprimand regarding your recent actions that have come to my attention. Specifically, the YouTube video you published on May 31, 2025, in which you made statements that cast the Department of Engineering Technology and Industrial Distribution, at Texas A&M University in a negative light.

While I respect your right to personal expression, your comments in the video were made publicly and in a manner that could reasonably be interpreted as representing the views of our organization. In the video you represented yourself as a member of our department.

The content of the video included critical remarks about the status and direction of our department, which were not only unsubstantiated but also potentially damaging to the reputation and credibility of our institution.

- *Voiced concern that ETID is not equipped to deliver education to the students and this is a shortcoming.*
- *Questioned the ability of our professors to have the skills needed to deliver training.*
- *Further, you stated that zero professors can deliver education and teach students on the methods needed for engineering technology.*

As a member of our team, you are expected to uphold the integrity of our work and to address any concerns through appropriate internal channels.

Please be advised that this reprimand will be placed in your personnel file.