

NMT Assay Report

New Mexico Tech eNewsletter

Fall 2021

Education Outreach at New Mexico Tech

<https://www.nmt.edu/stem/>

STORM FORCE and MESA and MATCH, oh, my!

Sharon Sessions (B.S. Mathematics and Physics, 1997) is currently Professor of Physics and Director of the NMT Office of Outreach. After earning her degrees at NMT, she went to University of Oregon for a Master's and Ph.D. in Quantum Field Theory. After a post-doc at the Max Planck Institute for the Physics of Complex Systems in Dresden, Germany, she returned to NMT in 2003. She has been actively involved in developing, coordinating, and leading community and education outreach efforts for many years, and was recently re-elected as a Socorro Consolidated School District (SCSD) Board member.

As a result of her outreach activities, Sessions was named the winner of the inaugural [2019 NMT Distinguished Faculty Service Award](#). The next year she was a [2020 Woman of Influence Award](#) recipient from Albuquerque Business Journal and named a [2020 Woman in Technology](#) by the New Mexico Technology Council. This year she was honored with the inaugural [2021 NMT Faculty – Alumni Ambassador of the Year Award](#) by the Office for Advancement and Alumni Relations.



The Beginning

In January 2016, Dr. Sessions was appointed the liaison between NMT and SCSD (a position created in the NMT strategic plan). She met with the superintendent, principals, and other stakeholders in several meetings during a “listening stage.” Several meetings had more than 70 attendees, demonstrating the community interest in working with NMT.

In April 2016, Dr. John Graham, the founder of Mentoring and Tutoring Create Hope (MATCH) New Mexico, came down from Santa Fe to present the MATCH mentoring program model to the Socorro community. The program included paying NMT students to mentor third graders to improve reading literacy. Sessions really wanted to help set up the program, but didn't know where the funding for the mentors would come from.

Serendipitously, a few weeks later, Sessions attended a Student Appreciation Dinner where she sat next to Marliss Monette, then NMT Financial Aid Director, who explained that the Federal Work/Study program designates funding for reading and math tutoring in the community — the perfect solution! Sessions coordinated resources with NMT, SCSD, and MATCH that resulted in a signed Memorandum Of Understanding (MOU) on September 26, 2016. This was the beginning of a partnership of the Socorro Educational Mentoring Alliance program, now in its sixth year at Parkview Elementary School in Socorro.

STORM FORCE and MESA and MATCH (continued)

This was a flagship relationship between NMT and SCSD that has since provided a foundation for more programs, and has the added benefit of inspiring mentors to pursue teaching careers. Because of the unique and sustainable resources assimilated, the Socorro program has become a model for the state!

STORM FORCE

Inspired by the mentoring program, [STORM FORCE](#) was created to be a community partnership for promoting educational opportunities in Socorro through collective impact. The acronym stands for STEAM OutReach and Mentoring Fueling Opportunity through Relationships, Community, and Education. Its mission is to inspire and empower Socorro County residents by promoting mentoring, skills in STEAM, and a culture of lifelong learning

Office of Outreach

Dr. Sessions is the Director of the new [NMT Office of Outreach](#). The Office is coordinating outreach activities across campus, and they are working to build capacity to be able to measure, evaluate and assess impact of outreach programs. Partnerships are key, and they are working with New Mexico Mathematics, Engineering and Science Achievement (NM MESA), as well as with students and coaches across New Mexico involved in the Science and Engineering Fairs and Science Olympiad.

The Office of Outreach is also closely connected to the NMT Master of Science for Teachers (MST) program, which offers a Master's degree for educators who have a bachelor's degree, a teaching license, and at least one year of K-12 teaching experience. This association will offer a beneficial way to collaborate, cooperate, and leverage the capabilities of both programs.

NMT and Socorro High School

New Mexico Tech has recently partnered with Socorro High School (SHS) to become an Early College High School (ECHS). Through dual credit courses, SHS students can earn a Certification in Small Business Management, an Associate's degree in General Studies or Business, or two years toward a four year degree by the time they graduate from SHS. There is capacity and enthusiasm for expanding programming to provide more opportunities for SHS students to prepare for the workforce in Socorro and across NM.

New Collaborative Programs

In Fall 2020, New Mexico Tech and Navajo Technical University (NTU) [signed a MOU](#) to collaborate on a water purification system on the reservation. The filtration technology was developed at the NMT Petroleum Recover Research Center (PRRC) to treat processed water in oil fields. The



Dr. Sessions accepting the 2019 NMT Distinguished Faculty Service Award from President Stephen Wells

STORM FORCE and MESA and MATCH (continued)

technology is capable of producing clean water for agriculture, livestock use, and eventually human consumption. NMT and NTU students are involved in every step of the [Navajo Nation Water Purification Project \(N4WPP\)](#), including collecting, testing, and analyzing community water samples. The goal is to create educational pathways with intern opportunities for Navajo students, with the hope that they will lead ongoing maintenance and research, finding water solutions for the Nation.

Future Vision

Dr. Sessions envisions a vibrant and thriving Socorro with one of the strongest school districts in New Mexico. She believes strongly in collaboration, and while much of her focus is in Socorro, she sees NMT as a leader in rural outreach, providing opportunities for students and families across New Mexico. Her commitment to and vision of future improvements in the quality of life on campus, in the community, and across the state remind us all that getting involved in a cause you're passionate about can have a huge impact.

Team Drone New Mexico

Dr. Mostafa Hassanalian, Assistant Professor, joined the Mechanical Engineering department in 2018. His research areas include [biomimetics](#) and [bio-inspired aerial and aquatic robots](#).

He's developing a [Team Drone New Mexico](#) program. The goal is to motivate and equip high school students to develop 21st-century skills and pursue careers in STEM disciplines.

Current and planned program activities include In-depth, multi-layered learning experiences for high school students in rural, tribal, and other underserved communities in New Mexico; mentorship between NMT students and state high school students and their teachers; professional development workshops and classes for high school teachers; and drone competitions and challenges for students.



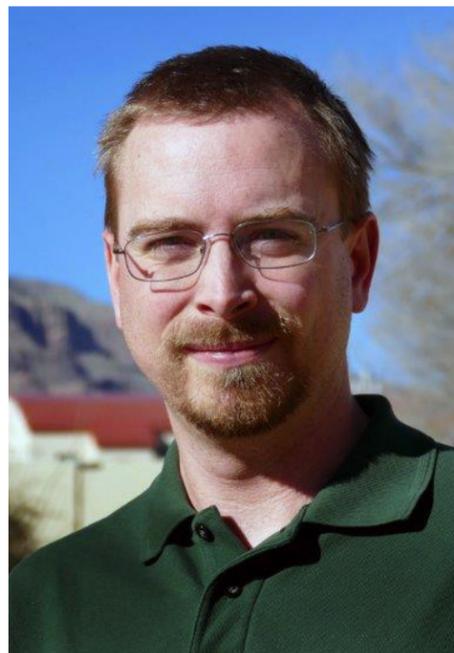
Dr. Mostafa Hassanalian discussing the NMT drone program, Exploration Day 2021



Team Drone and STEM Santa Fe held two ["Building and Flying Drones" camps](#) in June 2021 at Santa Fe Community College and Northern New Mexico College. A [one-day workshop](#) for NSF REU and RET participants was held at NMT in June 2021.

A dedicated [drones flight training space](#) in Skeen Library now houses a drone cage, virtual reality devices and flight simulators. Future plans include hosting remote drone competitions (using VR flight simulators and other technology).

Combat Robots - to NMT and Beyond!



Curtis O'Malley, Assistant Professor in Mechanical Engineering, joined the department in 2012; before then he was an instructor at CNM Community College. He earned his Civil Engineering M.S. (2007) and Ph.D. (2011) from Georgia Institute of Technology. While at NMT he has been awarded, and completed, a New Mexico Space Grant Consortium grant to develop and implement a new first-year Introduction to Mechanical Engineering course. In 2018 he was selected by NM Tech students to receive the **Student Government Association's Faculty Appreciation Award**.

Mechanical Engineering Outreach Background

Dr. O'Malley and Mechanical Engineering students have been engaged in outreach activities for years – traveling to fairs, expos, and other STEM events. These have included Big Brothers Big Sisters (BBBS) Discovery Festivals, New Mexico MESA Days, ¡explora! events, and Air Force Research Lab (AFRL) Super STEM Saturday. They are proud to have won several **BBBS Discovery Festival awards**: in 2016 “Best in Show” and “Kids

Choice” and in 2017 “WOW Factor” and “Most Inspirational.” These events, however, provide limited interaction with kids – a big splash, but gone after a day.

During the COVID-19 shutdown, Dr. O'Malley had time to consider how to expand the program. Then Student **Macs Brown** (*B.S. Mechanical Engineering, 2020* – read an interview with him in the [Summer 2019 Gold Pan](#)), a founder and member of the student-originated Battle Bot Design Clinic Project team, had mentioned that they had to travel to Texas to compete, as there were no “combat robot” competitions in New Mexico.

This led Dr. O'Malley to the idea of creating an [NMT Robotic Combat STEM outreach](#) program to take hands-on projects and competition beyond New Mexico Tech. Over time, he developed a course on “bots” and has taught more than 40 teachers (sometimes remotely) at primarily rural schools through NM Public Education Department classes.

Combat Robot Courses

The robot combat program consists of four session courses, with an expectation that participating teachers (and their students) may have little electronics, coding, or design knowledge or experience. Attendees are provided inefficient, less-than-ideal bots. They can only go forward and have no weapons. They're made of foam core with Arduino controllers. Teachers are given guides, answer keys and kits to build small bots.

First session: they need to adapt the RC receiver/transmitter using math and other skills. After about an hour's worth of work, they can have a more efficient bot.

Second session: they look at the code and learn about Arduinos. Middle school teachers will help their students learn more about coding; high school teachers can help their students learn to edit and comment code.

Third session: involves teaching students how to modify the code to make the bot go in reverse.

Combat Robots - to NMT and Beyond!

Fourth session: participants get to drive a bot with a wedge, and then they decide what kind of weapon to add to theirs.

In Spring 2021, O'Malley taught a high school/community college course at UNM Valencia. A grant for rural schools paid for enough parts (bot body parts were 3D printed, not foam core) for 100 kits. There were about 30 students (in person) and another 30 remote (watching recordings) who each received a kit. The rest of the kits will be used for future classes or competitions.



Combat Robot in the arena, November 2021

Combat Robots and Competitions

These are small robots. The NMT program began with one original weight class – 3 pound (1.36kg) robots. In November 2021 two new classes were added: 1/3 pound (150g) and the NM MESA Arduino-controlled class. As interest has grown (from three robots in April 2021 to 16 in November 2021 and 40 bots already planning to attend in April 2022) they plan to add the one-pound class to the competition. Currently, Mechanical Engineering Design Clinic teams build and battle with 3 pound bots while student clubs use the 1/3 pound class. NMT has adopted SPARC ([Standardized Procedures for the Advancement of Robotic Combat](#)) robot construction specifications, judging guidelines, and match rules.

The [first NM Robot Combat Competition](#) was held on campus in April, 2021 with two teams of NMT Design Clinic students and a third team consisting of Dr. O'Malley and another faculty member's family. Preparations involved building a suitable portable combat arena, an effort that included many students and several faculty members in the design, prototype, and build phases.

In October 2021 O'Malley and NMT students held a [virtual workshop](#) during the 6th Annual New Mexico Science Fiesta, and again with BBBS of NM in November 2021. They also took the portable combat arena to ¡explora! for a meet with 1,400 spectators throughout the day.

The second tournament, held November 6, 2021 as part of the reinvented NMT Exploration Day open house, had 90+ participants and was supported by three dozen mechanical engineering



Combat Robot check-in table, November 2021

students and faculty. The program already has another eight middle and high school NM-MESA classes participating in online workshops and planning to attend the next tournament in April 2022.

NMT's Mechanical Engineering curriculum now includes hands-on project work in all four years. First-year students take “Introduction to Mechanical Engineering” (aka Freshman Design); they build laser tag

Combat Robots - to NMT and Beyond! (continued)

robots and a plywood battle arena. O'Malley hopes to use that arena for foam core bot battles (senior bots have weapons, so they can't compete in a plywood arena). Students continue hands-on design work in the Sophomore Design course. Beginning in their Junior year, students work on team capstone design projects that continue through their Senior year.

Future Plans

Future competitions are scheduled for April 23, 2022 and November 2022; they are open to students from NMT and other universities, alumni, community members, and local middle and high school students. O'Malley's long-term plans are to grow the competitions – both the number of teams and the number of workshop participants and volunteers.



Portable Robot Arena, November 2021



150 gram bots in the arena

Three teams competed in April 2021, 16 teams in November 2021, and they hope to grow to 40 or more by April 23, 2022.

Alumni are encouraged and welcome to attend workshops, volunteer and compete in tournaments, and are always invited to attend tournaments.

Details at [NMT Robotic Combat Tournament Information](#).

Upcoming 2022 New Mexico Tech Events: *Save the Dates!*

September 15 - 16, 2022

28th Annual NM President's Golf Tournament

October 20 - 23, 2022

49ers Homecoming - *All You Need is Pi*