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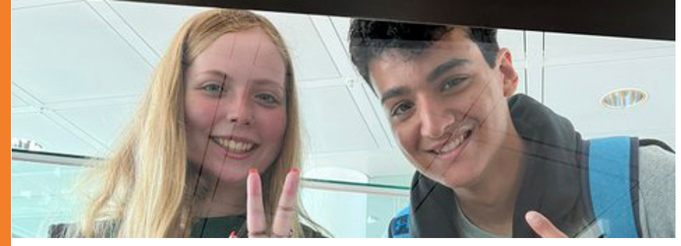
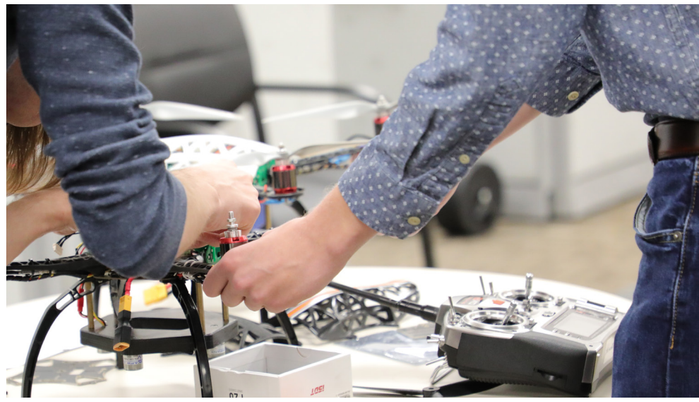




2022 VIRGINIA TECH ENGINEERING EDUCATION ANNUAL REPORT

pg. 12

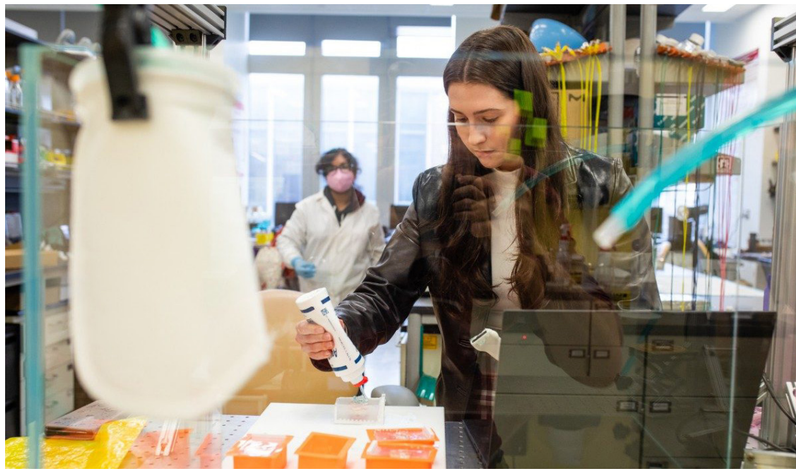
New, $3 million effort to connect college support networks for low-income engineering students

Thanks to a $3 million grant from the National Science Foundation (NSF), a collaborative team from Engineering Education at Virginia Tech and beyond is building a research hub headquartered at Virginia Tech to help untangle the network of vstudents face at four-year universities and community colleges.

pg. 32

Transforming the Graduate Student Experience

With the support of a $1.2 million organizational transformation grant from NSF, the college will take the graduate eduation puzzle pieces and strengthen their connections through the development of PROTEGE, focusing on changing the graduate engineering education system by connecting, integrating, and improving numerous processes, in addition to providing support for graduate students.



pg. 15

Rising Sophomore Abroad Program takes flight once more

After a two-year hiatus due to the COVID-19 pandemic, this spring's travel was organized into four tracks: Spain and Morocco, Ireland and the United Kingdom, and two to Italy and Germany, with about 30 students per track. While RSAP is targeted to first-year engineers, interested students who were unable to travel in 2020 and 2021 were also invited.

pg. 26 ›

Changing the face of engineering education: 7 faculty at a time

With backgrounds in chemical, biomedical, electrical, and materials engineering, our seven newest faculty in Engineering Education represent the ever-changing spectrum of engineering experience at Virginia Tech! Meet our newest faculty.

Top 5 Areas of Future Focus for Engineering Education

pg. 18 ›

What is the future of engineering work or engineering education? Our team of engineering education thought leaders shared their thoughts on how they see the future of engineering changing over the next 5 to ten years.

pg. 22

Engineering for the Real World

Launched this fall as an approved course and directed by David Gray, collegiate assistant professor in engineering education, Interdisciplinary Capstone is a unique two-semester course designed to bring together students from across the College of Engineering. This year, nearly 100 senior engineering students will partner on industry projects or work in competition teams.

pg. 40

Homero Murzi receives NSF CAREER award to create the next generation of engineering education leaders in diversity, equity, and inclusion

The old adage "necessity is the mother of invention" is lived every day in the field of engineering and especially in Homero Murzi's latest National Science Foundation Faculty Early Career Development (CAREER) grant. Based on his personal experiences with DEI, Murzi will tackle the issue of building a sustainable system for educating the next generation of leaders in engineering education.

IN THIS REPORT

PUBLICATIONS pg. 34
AWARDS & HONORS pg. 38
RESEARCH GRANTS pg. 44
WELCOMES & TRANSITIONS pg. 46

RESEARCH EXPENDITURES

$2,038,807.07

Review the breakdown of our new NSF, external and internal grants on **pages 43-44.**

Find our 2022 journal articles on **pages 34-35.**

48

JOURNAL PUBLICATIONS

OUR DEPARTMENT

HAS GROWN

53 DOCTORAL STUDENTS

10 STAFF & A/P FACULTY

19 TENURED/TENURE-TRACK FACULTY

10 ACADEMIC ADVISORS

11 COLLEGIATE FACULTY, INSTRUCTORS, & PROFESSORS OF PRACTICE

Read the "Changing the Face of Engineering Education" on **pages 26-29.**

8 DOCTORATES AWARDED

Top, left to right:

Dr. Cheryl Beauchamp

Dr. Alejandro "Andrew" Espera, Jr

Dr. Tawni Paradise

Dr. Kai Jun "KJ" Chew

Dr. Teirra Holloman

Bottom, left to right:

Dr. Jessica Deters

Dr. Yousef Jalali

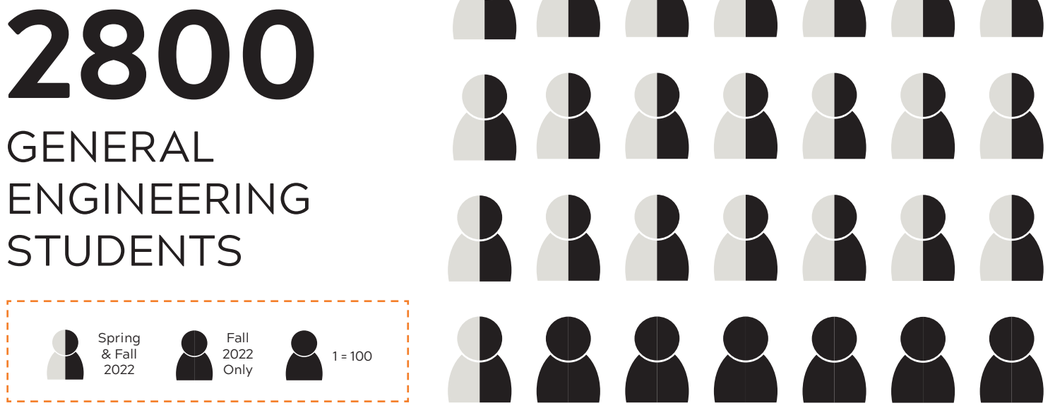
Dr. Joshua Garcia-Sheridan

Get our 2022 doctoral graduates' dissertation details on **pages 36-37.**

OVER

2800

GENERAL ENGINEERING STUDENTS



22,293

ADVISING CONTACTS

From advising appointments to drop-ins, our advising team has an immense impact on our undergraduate students. Read their story on **pages 10-11.**

39 FOUNDATIONS OF ENGINEERING I

32 FOUNDATIONS OF ENGINEERING II

3 FOUNDATIONS OF ENGINEERING PRACTICE

SECTIONS OF MANDATORY **GENERAL ENGINEERING COURSES**

NEARLY

10,000

HOURS OF STUDENT WORK IN FRITH

See more student work from the Frith First-Year Makerspace on **page 43.**

ENGE DASHBOARD

Message from the department head

Although many of the impacts of the COVID-19 pandemic are still with us and will be for a long time, 2022 was the year where we really managed to return to a "new normal." As the Spring semester progressed, bringing with it the welcomed warmer weather and longer days, we also saw the end of the classroom mask mandate. There was much celebration at the end of this academic year, with first-year students busily in the Frith Makerspace finalizing their design projects, and our new cohort of Interdisciplinary Capstone students presenting their work to industry sponsors in an expo — see these projects in the article on page 22 in this report. We had a massive celebration when many of our Ph.D. graduates finally got the opportunity to "walk" in the commencement ceremony, and we were able to congratulate our Watford award winners in-person — read more about them on page 42. We were also delighted to resume traveling in our Rising Sophomore Abroad Program (RSAP) — read more about this on page 15 in this report!

During the Fall, we saw the fruits of an exceptional hiring season, welcoming five new tenured and tenure-track faculty (bringing that total to 19), two new collegiate faculty (bringing that total to six), and two new advisors (bringing that total to 10) — go to page 46 to read more about them. Our Department now has a full time complement of 50 faculty and staff, having grown by nearly a third over the last five years. This level of resource enables us to offer high quality education to close on 3,000 first year students and more than 50 PhD. All of this is underpinned by a vibrant and externally funded program in Engineering Education Research. During this same 5-year period, our tenure-track and tenured faculty have doubled their levels of funding and publications. During 2022, we celebrated a $3 million grant awarded from the NSF to a team of our faculty who will take the lead on a new multi-institutional partnership to support low-income students in engineering programs across the country — read more about it on page 12! This report also showcases the many awards and recognition that our faculty and students.

During this year, I have been served by an exceptional leadership team in the Department, with two new Assistant Department Heads, and an enlarged structure for my Executive Committee, bringing a greater diversity of voices into Departmental decision-making. 2022 also saw the first in-person Advisory Board Spring meeting since the pandemic, and following that the election of a new Chair and Vice-Chair to our Departmental Advisory Board, and the recruitment of three new energetic and skilled members. This group continues to be important external advocates for our work while also bringing fresh external perspectives on strategic priorities. You can get a sense of the value of this work by reading the article on page 18 highlighting their collective perspectives on the future priorities for the preparation of engineers.

Going forward, we have updated our Strategic Plan to guide the next five years of work. A key focus continues to be creating a space for focused development of talent — building a community where everyone can flourish. We have a renewed focus on strategic deployment of our resources — looking especially at space and finances, as well as improving our processes for graduate student funding. We are excited to be centrally involved in the planning of the new Frith Lab and adjacent classroom space in Mitchell Hall (the replacement for Randolph Hall). Inspired by the College Strategic Plan, we are having a relook at our undergraduate courses to make sure we have the best possible alignment with the outcomes that students will need for employment in a rapidly changing world. This runs alongside our work to more closely integrate our research and teaching as well as the operations that support these. Finally, we aim to lift the bar on building our reputation nationally and internationally, by smarter communication of the distinct set of niches in which we are making an impact.

This was really a very productive year with significant developments and achievements. The "new normal" is looking like a great place to be — after the worst of this pandemic we will certainly never again take for granted the joy of working together and interacting with our students. We are proud to present a documentation of the year's highlights in this annual report. Thank you for your interest in and support for our work.

Warm regards,
Jenni Case

MISSION & VISION

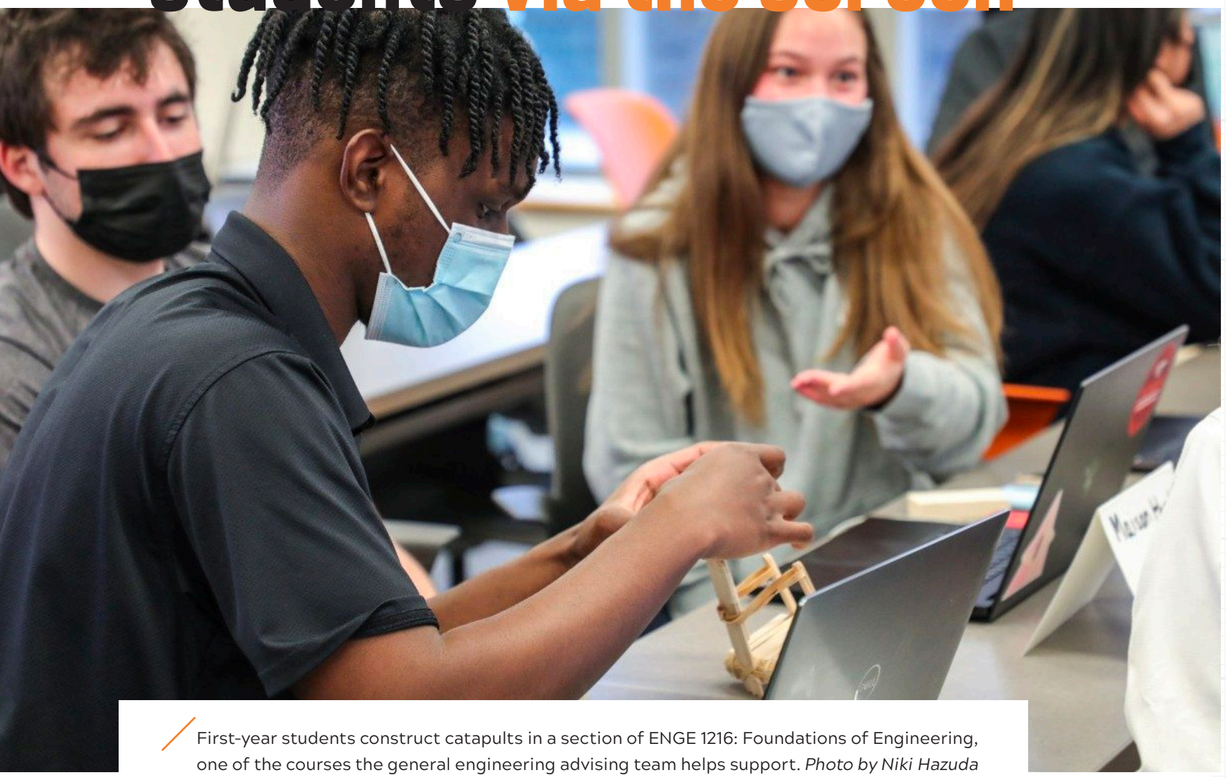
We offer a **world-class education** through exceptional advising, pedagogy, scholarship, and operational practices that **empower informed career decisions** and **serve as a meaningful touch point** for undergraduate and graduate engineering students at Virginia Tech.

We are **a community of forward-thinking professionals** who develop and disseminate knowledge, fostering cohesion between innovative research and practice.

We are a **globally-recognized leader** in preparing emerging engineers, educators, and scholars who work across technical, cultural and social boundaries to **address contemporary challenges and serve the broader community**.

We **influence** practice, **advance** knowledge, and **shape** careers in an environment that **nurtures learning and growth** within the field of engineering education.

Supporting engineering students via the screen



First-year students construct catapults in a section of ENGE 1216: Foundations of Engineering, one of the courses the general engineering advising team helps support. *Photo by Niki Hazuda*

Amid chaos, the general engineering advising team's pandemic pivot improved connections with first-year engineering students.

First, COVID-19 claimed Carly Daffan's senior prom. Then her high school graduation.

What the pandemic didn't take from her in 2020 was a smooth transition into Virginia Tech's College of Engineering thanks to the team of 10 general engineering academic advisors.

The team transitioned overnight from in-person to online to care for the 2,583 first-year engineering students who, like Daffan, now a sophomore industrial and systems engineering major, struggled to start college amid a pandemic.

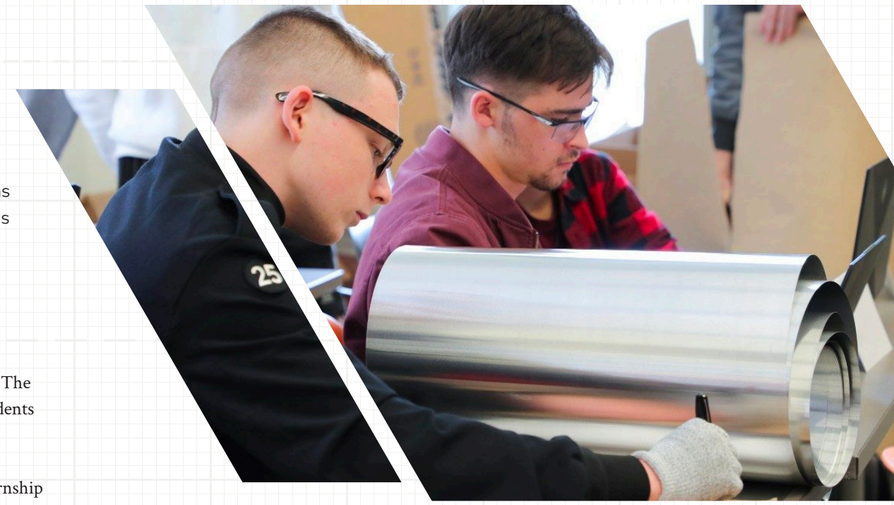
The advisors "were always there for any kind of issues," Daffan said. "Family issues, mental issues, academics. And if they didn't have the answer, they would get back to you as soon as possible. I felt like they did more on their part to make it feel like we weren't alone."

In March 2020, Marlena Lester, then director of advising in the Department of Engineering Education, was about to leave for vacation when she got the news that Virginia Tech was moving classes and services online because of the pandemic. The announcement came at the busiest time of the year for her staff: in the middle of fall course registration and first-year orientation preparations.

"We were asking, how do we support each other?" Lester said. "How do we make sure everyone around us is supported? What are some best practices for teleworking? How do we get office chairs? How do we get video cameras? How do we Zoom?"

In the pre-pandemic world, advising was all in-person and as regular as the seasons.

Each summer, advisors held on-campus orientations to onboard engineering students who would matriculate in the fall. They helped students fill out paperwork, finalized class schedules, and conducted visits with family members. Once students arrived in the fall, advisors hosted workshops on time management and study strategies as well as to introduce the 14 degree-granting disciplines



TOP: General engineering students work on the aesthetic turbine project in Foundations of Engineering.

BOTTOM: Students in Foundations of Engineering construct catapults from specific materials.
Photos by Niki Hazuda

offered in the College of Engineering. The next spring, they guided first-year students through the major selection process, helped those struggling academically, showcased the college's clubs and internship opportunities, and prepared anew for the following year's class.

The pandemic, of course, broke the cycle.

Transitioning to all-virtual meant a complete overhaul. Unsure of their students' internet situations at home, advisors tried to streamline their resources. Rather than working from multiple online platforms to guide a student's academic journey, they consolidated information down to one site — one PDF, if possible.

> "We had to come together as a team and figure this out. There was no more just sticking your head out of your office to ask a colleague a question."

The university adapted as well, allowing one-time policies for grade assignment and change-of-major requirements to account for the sudden disruption and shift to online course delivery.

While the changes were implemented to support students, they generated many questions. Advisors were on the front line of helping students navigate them. Class registration — typically a one-week affair — took several weeks because the advisors each had up to 300 students to assist one-on-one by Zoom.

"Trying to convey those different options to those different populations was very challenging," said Lester. "I think for me, it was the moment that I just said, 'OK team, we have a question and we're going to make zero assumptions about what we've always done.'"

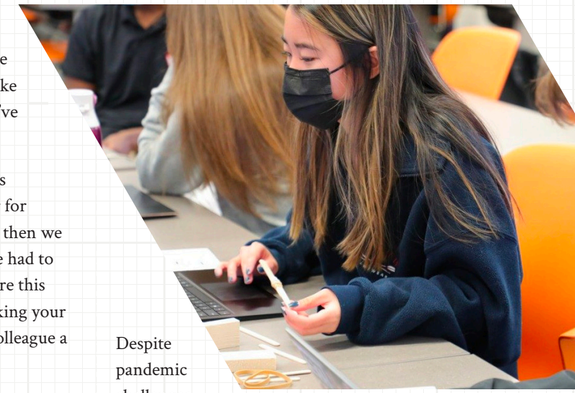
"Zoom is old hat now," said James Newcomer, advising coordinator for engineering education, "but back then we were still fumbling around it. We had to come together as a team and figure this out. There was no more just sticking your head out of your office to ask a colleague a question."

Daffan appreciated the new weekly electronic newsletters she received from her advisor, not to mention the regular check-ins by Zoom and responsive emails to her questions about her schedule, her grades, her classes, and her life.

"She always had an answer, which was really comforting," said Daffan, a Fairfax, Virginia, native. "I know a lot of upperclassmen, pre-pandemic, didn't know who their advisor was. I think the pandemic made the advisors re-evaluate their approach."

"I needed help the first day of classes and my advisor was there to help me figure everything out," said Spencer Macturk, sophomore in mechanical engineering and undergraduate lab assistant in the Frith First-Year Makerspace.

"Because of them, I am now in the right math class, have completed a schedule that has set me up for the rest of college, and accepted a co-op for the summer and fall semesters. I couldn't have done what I did at Virginia Tech without my advisor."



Despite pandemic challenges, the team was able to forge an improved advising process.

Paper forms migrated to electronic records. An on-campus workspace once filled with the whole team is now home to just two, as the staff rotates in and out on a weekly basis as part of a flexible work pilot that provides a combination of in-person and online advising in line with student needs.

Thanks to the pilot, the open space is used for other academic purposes. Zoom allows advisors to meaningfully interact with students. They can provide resource links in the chat feature, share screens to navigate schedule changes, and take better notes on a student's struggles and successes.

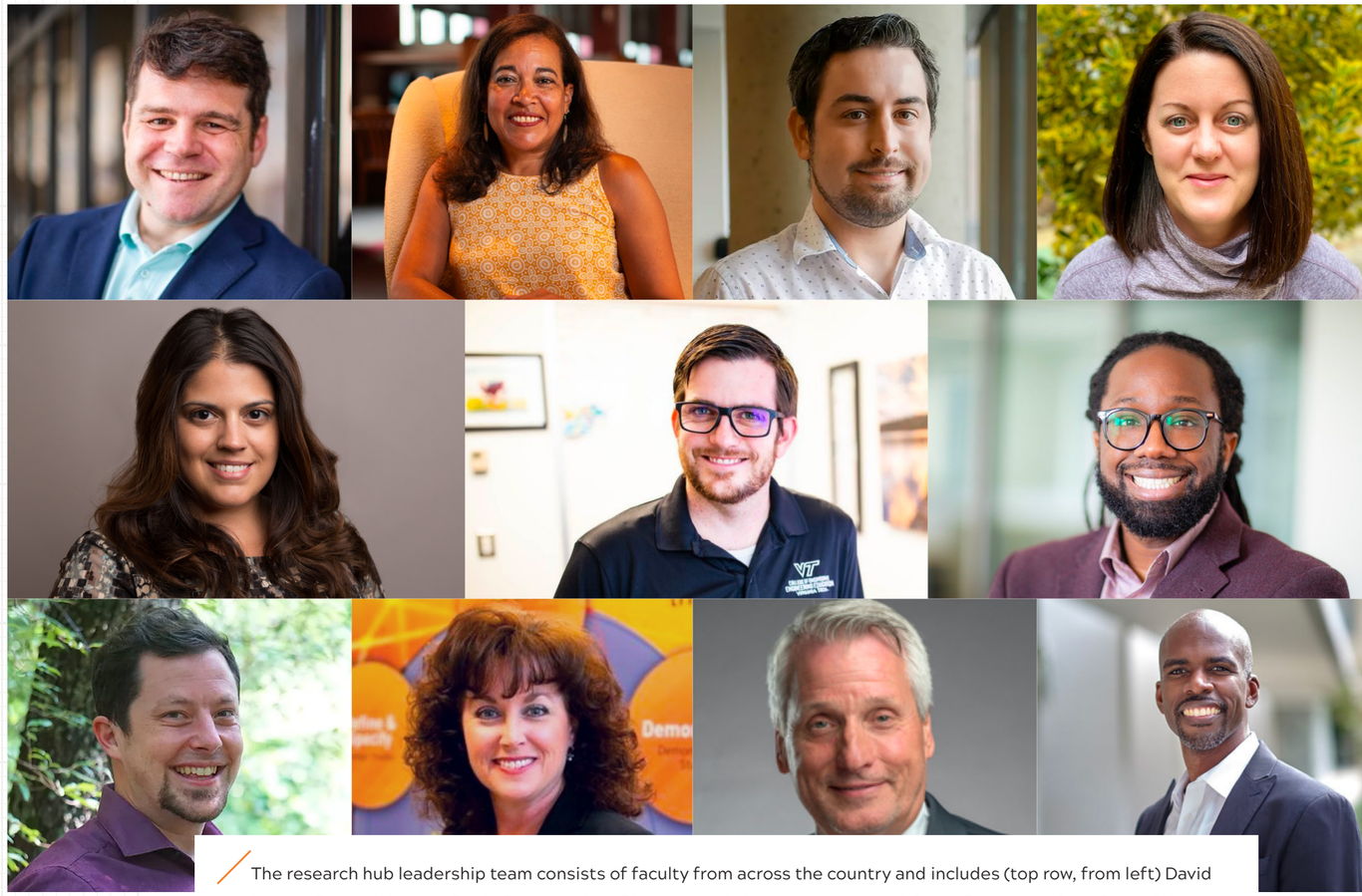
"All of the technology makes it more efficient," said Newcomer. "And we were able to better connect to the students through a format that was a natural extension of their culture."

Article written by Michael Hemphill and originally published on VtX on April 28, 2022.

READ

Read more about the research hub grant at bit.ly/ROPESHub22

New, $3 million effort to connect college support networks for low-income engineering students



The research hub leadership team consists of faculty from across the country and includes (top row, from left) David Knight, Bevlee Watford, David Reeping, Amy Richardson, (middle row, from left) Sarah Rodriguez, Jake Grohs, Walter Lee, (bottom row, from left) Dustin Grote, Teri Reed, P.K. Imbrie, and Bruk Berhane.

Imagine a connect-the-dots puzzle. It's easy to solve – just follow the numbers in order so a picture becomes clear. However, miss one number, one little dot, and the picture that should have been there is now a tangled mess of lines.

For a low-income, first-year, or transfer student in engineering, navigating the collegiate infrastructure can be just like a connect-the-dots puzzle: labyrinthian.

But thanks to a $3 million grant from the National Science Foundation (NSF), an academic team from the Department of Engineering Education is building a research hub headquartered at Virginia Tech to help untangle the network of systems that low-income engineering students face at four-year universities and community colleges. David Knight, associate professor in engineering education, will serve as lead principal investigator for the collaborative research effort.

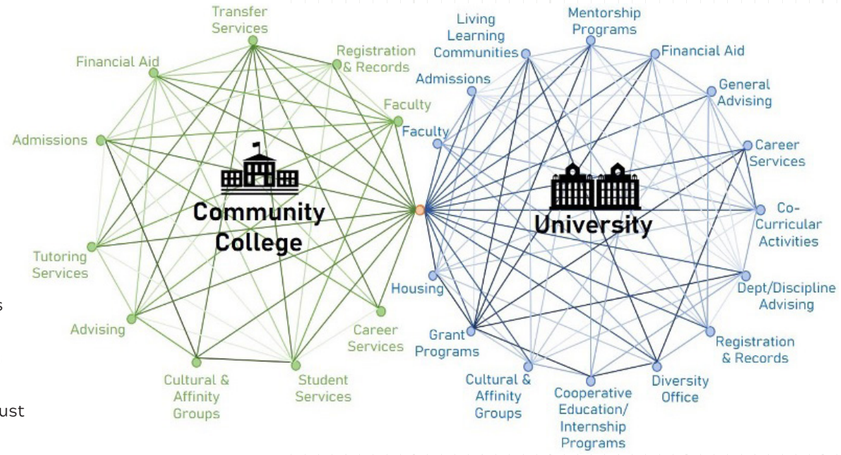
"We have students who are just stuck in this web of campus offices," Knight said. "We want to help enhance partnerships within institutions and their networks so procedures, collaborations, and arrangements can work better together."

This research hub builds on prior experience with the NSF Scholarships in STEM (S-STEM) program for Virginia Tech — a grant system for funding low-income student scholarships as well as research and activities that support recruitment, retention, transfer, student success, and more.

The most recent project is the $5.4 million Virginia Tech Network for Engineering Transfer Students (VT-NETS), led by principal investigator Bevlee Watford and supported by co-principal investigators Knight and Walter Lee. VT-NETS is a collaborative effort among Virginia Tech, Virginia Western Community College, and Northern Virginia Community College to establish strong networks in support of engineering transfer students in the pathway from community college to bachelor's degree.

Through working on VT-NETS, the team realized each institution had much to learn about the others before kicking off productive research and collaboration.

"It's like we were speaking different languages at times," said Knight. "There were moments during the project where we recognized if we had known something from day one, or if we knew what kinds



This figure from the research hub project proposal outlines not only the connections between community colleges and universities, but also the numerous offices students must navigate to receive support.

of questions to ask about a particular organizational context or goals, then we would have been able to hit the ground running a lot quicker."

Through the work with VT-NETS, the team was inspired to pursue a grant from one of NSF's newest initiatives, the Scholarships in STEM Network. Virginia Tech leads one of four research hubs funded in NSF's first round. The network is designed to connect partners across the country to create and maintain collaborations supporting low-income students, and the hubs are a critical new component of the S-STEM program to ensure these programs can broaden their impact.

"NSF thought it would be helpful to have research hubs that can look across our existing S-STEM programs and build capacity within that community, build new knowledge," said Knight. "For our grant, we're hoping to be a hub that will bring people together to focus on organizational issues."

The the research hub leadership team is guided by the overarching research question "How can intra- and inter-institutional partnerships be designed, built, and sustained to systematically support low-income engineering student success?" and consists of faculty from four institutions:

- Knight, Lee, Jacob Grohs, Watford, and incoming engineering education Associate Professor Sarah Rodriguez of Virginia Tech.
- Teri Reed, P.K. Imbrie and engineering education alumnus David Reeping of the University of Cincinnati.
- Dustin Grote, Virginia Tech higher education alumnus and engineering education postdoc at Weber State University.
- Amy Richardson, engineering engineering Ph.D. candidate and faculty member at Northern Virginia Community College.

Bruk Berhane of Florida International University will serve as the external evaluator for the hub.

According to Lee, in theory we know what should work, but it's often a lot harder to implement something that's both effective and sustainable in practice.

"I'm most excited about the opportunity to learn from the on-the-ground work being done to support low-income students across the S-STEM program," said Lee, co-principal investigator on the grant and associate professor in engineering education. "It's not often that we get a chance to systematically examine what's worked" or not worked.

> "For our grant, we're hoping to be a hub that will bring people together to focus on organizational issues."

To facilitate the community of practice building, the team will run its own research accelerator grant program, working with 40 S-STEM programs across the country during the duration of the grant. The hub leadership team will serve as mentors for the programs and will help the community share data, insights, and new ideas with one another.

Over the next few summers, the Virginia Tech team will host a summit for the accelerator grant teams to learn and build new knowledge on how to establish and sustain meaningful partnerships that support low-income engineering students. By bringing so many teams together, Knight hopes the group will be able to support change across the teams' home institutions and collectively think about how to build more sustainable organizational processes.

"We're intensely focused on the systems that students are coming into. We want to change the narrative away from the idea that we need to 'fix' the students," said Knight.

"Each campus office can play a critical role in supporting students, but we don't work well enough across offices on a single campus or between campuses. We hope the hub can improve how partnerships work within and between institutions so that the whole system can work better to support students."

Article written by Niki Hazuda and originally published on VtX on May 25, 2022.

Rising Sophomore Abroad Program takes flight once more

On the Spain and Morocco track, students explored the famous Hassan Tower Mosque and the Chellah, ancient Roman ruins, and scenic gardens of Rabat. *Photo courtesy of Lisa Schibelius for Virginia Tech.*

Picture it: Sunsets in Morocco. Afternoon tea in the United Kingdom. Wooly sheep in Ireland. Decadent pasta in Italy. And nearly 100 engineering undergraduates traveling across Europe and North Africa for two weeks.

While not exactly a dream vacation, the award-winning Rising Sophomore Abroad Program (RSAP) is a tour de force of global engineering education and cultural experiences.

Since 2014, the Department of Engineering Education (ENGE) has hosted over 800 Hokie engineers through RSAP, the two-week international May experience, and a semester-long course Global STEM Practice: Leadership and Culture.

After a two-year hiatus due to the COVID-19 pandemic, this spring's travel was organized into four tracks: Spain and Morocco,

> One thing that really helped was Professor Murzi's favorite quote, 'It's not wrong, it's just different.' That was probably the best advice to use in any global aspect.

Ireland and the United Kingdom, and two to Italy and Germany, with about 30 or students per track. While RSAP is targeted to first-year engineers, interested students who were unable to travel in 2020 and 2021 were also invited, adding diversity to the groups and creating an opportunity for students to develop mentorship relationships.

For RSAP 2022, students explored Spain, Morocco, Ireland, United Kingdom, Italy and Germany. *Photos by students, track leaders and faculty during the RSAP 2022 program.*

> "Engineers are meant to be for the people, and we can't grow if we stay stagnant. There's a whole world of people there, and if we stay in our little box, we'll never get to hear their stories."

Prior to any plane departures, the students explored their track's destination countries, discussed planning, created poster presentations, and practiced their reflection skills.

RSAP program director and ENGE Assistant Professor Homero Murzi said the course was developed not only to help students prep for travel, but also to reflect on how their track will "impact their development as future engineers."

"The students bring a 'jump right into problem-solving' mindset from high school," Murzi said, "so we spend the first few weeks of the semester thinking about the world problems we're facing as engineers, and how to work with other people to really understand first the scope of the problems we're trying to solve."

In addition to track meetings, the course blends thought-provoking activities with lectures from faculty with international experience and global engineers. Through Q&A sessions and one-on-one interviews, students can develop networking and critical-thinking skills in a range of engineering disciplines.

For electrical engineering major Yasser Hassan, a dual resident of Ashburn, Virginia, and Sudan, Africa, the Global STEM course is "by far my most fun class at Virginia Tech."

For one interactive class, students were divided into three countries: the Starbursts, Milky Way, and Hersheys. Each of the nations had its own rules, traditions, and habits, and even a specific location in the classroom. Then, the students were tasked with figuring out how to collaborate and develop solid business partnerships.

"The course helped a lot in getting rid of our personal biases and be more open to change," Hassan said. "One thing that really helped was Professor Murzi's favorite quote, 'It's not wrong, it's just different.' That was probably the best advice to use in any global aspect."

The saying emphasizes that differences, regardless of origin, are just that – differences. The future of work requires "global understanding," said Murzi, so highlighting cultural contrasts and pushing students to explore their potential uncertainty or discomfort is woven into the Global STEM course.

Students also are trained to make meaningful reflections to help them actively engage in the two-week experience, going beyond surface-level insights as they travel the different countries. The RSAP itineraries are packed with tours of engineering companies, such as Harbauer, an environmental technology company in Berlin; visits with students from the local higher education institutions, such as the Center for Cross-Cultural Learning in Rabat, Morocco; and, of course, historical sightseeing to places such as St. Patrick's Cathedral in Dublin.

Software engineering major Jenny Li said the Global STEM course had already challenged her to examine unconscious biases and pay attention to global problems, especially those not covered by news outlets, but even her class research didn't teach Li everything she wanted to know. Over a lunch with Center for Cross-Cultural Learning students in Morocco, she experienced Murzi's favorite saying firsthand.

"Where I learned the most was when we just spent time listing out our differences and similarities," she said. "The funniest part was the shared pain of being an engineer with sleepless nights and hard courses. Going forward at Virginia Tech, I think I'm encouraged to travel more and see how differences can work together."

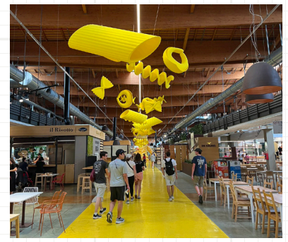
Fellow Spain and Morocco traveler Ameera Hossain, a Bengali American from Northern Virginia, said RSAP was a firm reminder of why she wants to be an engineer. As a rising senior and transfer student, she began the academic year concerned that engineering wasn't the right path for her.

"I think when I transferred to Virginia Tech, I worried because I couldn't see any care for people when it comes to STEM," said Hossain, a computer engineering major focusing in networking and cybersecurity. "Our work is meant to help people and keep their safety in mind while doing so."

Through the Global STEM course and travel experience, Hossain was reminded that even disparate countries with unique problems and solutions share common goals.

"Engineers are meant to be for the people," Hossain said, "and we can't grow if we stay stagnant. There's a whole world of people there, and if we stay in our little box, we'll never get to hear their stories."

Article written by Niki Hazuda and originally published on VtX on June 13, 2022.



Top 5 Future Focus

for Engineering Education

What is the future of engineering work or engineering education? Our team of engineering education thought leaders shared their thoughts on how they see the future of engineering changing over the next 5 to ten years.

For Maria Bothwell, Chief Executive Officer of Toffler Associates and chair of the Engineering Education (ENGE) Advisory Board, looking to the future is her day job.

Bothwell connects daily with clients in science, technology and engineering who struggle to understand how they'll meet the evolving employer and employee needs in the next decade.

"There are many significant shifts happening, not just with the future of work, but also in building resilience and sustainability to address climate implications; evolving organizations diversity, inclusion and accessibility; navigating geopolitical power shifts; and assessing globalization versus localization with supply chains," she said.

"As Alvin Toffler would say, we're in the world of future shock. And the only way to make sense out of it is to think about what are those possibilities in the future, understand where there are risks and opportunities, and then, you can start making decisions today to affect the future."

During the Fall 2022 ENGE advisory board meeting, Bothwell connected with the other board members to parse through some of those future possibilities.

They outlined what they saw as their top five focus areas for Engineering Education to tackle as part of, as Bothwell said, preparing students for career paths that may go "many, many places, and get beyond the traditional engineering curriculum": artificial intelligence (AI), automation & ethics; collaboration & teamwork; leadership & decision making; holistic student support; and the changing nature of work and the workforce.

ARTIFICIAL INTELLIGENCE (AI), AUTOMATION & ETHICS

Advances in AI and automation in the last 25 years have had a dramatic impact on how engineers solve problems. But with ease and access have come ethical and safety concerns: how data is collected, shared, interpreted or even trusted in engineering work.

Arthur Ball, Collegiate Assistant Professor, Department of Electrical and Computer Engineering, Virginia Tech

In the future we're going to be gathering data, vast quantities of it, on virtually everything. Our students are going to be a big part of that, trying to parse through the data to figure out what's useful and what's not. The bigger picture is: what is the data? Do we want to be collecting it? Who knows that we have this data? These are questions that are really sort of a big picture that a lot of students today aren't considering.

Patrick Cunningham, Associate Professor of Mechanical Engineering, Rose Hulman Institute of Technology

A colleague was showing me an AI tool that can take what you type in, like, "I want to compute computer code that does this in Matlab," and it writes the program for you. OK, that's stunning, but somebody has to be critically thinking and have a deeper understanding to be able to create the tool to do that.

If we over rely on those tools and forget to develop a deeper understanding to be able to interpret, to make decisions based on that information, if we miss that, we're stuck. These are wonderful tools, but let's leverage them as tools. Let's not use them as crutches and, let's help our students to do the same.

Sreyoshi Bhaduri, Senator at the Society of Women Engineers and Research Scientist at Amazon

Artificial Intelligence and automation is all around us - from virtual assistants on our smart devices, to self-driving cars, and even automated grading bots. The World Economic Forum anticipates that by 2025, 97 million new jobs will emerge in the global economy, fuelled by greater interaction of humans and machines. Engineering educators are uniquely positioned to lead the narrative on and interaction with emergent technologies, including AI and other automation.

Knowing how to code or analyze data will no longer be a specialized skill, and engineers need to be equipped with resources to evaluate, use and develop responsible and ethical tools for inclusive problem solving. Research and education for the engineers of the present (and thereby, the future) will define the teams that will continue innovating on the technologies that society will increasingly adopt.

Maria Bothwell, Chief Executive Officer of Toffler Associates

One of the things we've spent time thinking about is that idea of human-machine trust and trusting machines in society, whether it's automatic vehicles or automatic weapons and the soldiers working with them. Whatever system we're talking about, there's the aspect of the human-machine trust, and building on that; to me, it's such a complex issue that gets into so many aspects beyond engineering. But engineers need to be very aware and that's why a multidisciplinary, collaborative group needs to be working on it.

Brian M. Kleiner, Bogle Professor and Director, Myers-Lawson School of Construction

Human-machine trust relates to human-machine interaction more generally and one area of future concern as automation increases across sectors is the safety, health and wellness of humans. A more automated system is not necessarily a safer one. In fact, many devices and pieces of equipment designed to decrease risk may reduce one type of risk, but inadvertently create another. An example from the construction industry is falls from heights. This is the most prevalent cause of death. To reduce the hazards associated with scaffolding and ladders, small boom or scissor lifts have been used. These can create risks such as "caught between". Another example is the use of drones to inspect bridges or buildings. Fall risks are eliminated but "struck by" risk is increased. Engineers need to learn not to automate for the sake of automation, but rather to support the human experience.

COLLABORATION & TEAMWORK

Engineering is global work, requiring collaboration and strong communication. Teaching our students how to work across differences, whether personal or engineering discipline, will impact their success as professionals.

Arthur Ball, Collegiate Assistant Professor, Department of Electrical and Computer Engineering, Virginia Tech

Systems today are becoming heavily intertwined. Many disciplines are regularly involved in trying to come up with an optimized result, system or outcome, but a lot of students are siloed. They don't quite realize how important it is to actually know a little bit about everything and not just a lot about something. I know Engineering Education has a very good program called the Interdisciplinary Capstone – I'm involved in that – and I think that that's a great idea.

We need to expand on that significantly, but I don't think we're going to do enough fast enough.

Courtney Smith-Orr, Teaching Assistant Professor, Electrical and Computer Engineering, UNCC

We teach our students what it is to be a professional engineer; the level of focus and concentration they have to have; and how we learn and continue to learn to collaborate with others in a space. But having worked in silos for so many years now, getting students to collaborate and talk to their peers has become more and more of a challenge. I'm a huge advocate for active learning, but we have to continue to develop new ways to engage our students on their journey to becoming future engineers.

Laura Bottomley, Director of Engineering Education, North Carolina State University

I see engineering becoming much more multidisciplinary, interdisciplinary, and in fact, going beyond just the engineering disciplines. I think if we're going to succeed, we're going to have to recognize there's expertise in other disciplines besides engineering that can help us solve engineering problems. Innovation lies at the boundaries of the disciplines.

Ken Walker, Partner & Portfolio Chairman, Falfurrias Capital Partners

Back when I was a young engineer, everyone was kind of on your own. Team projects were few and far between. Now, as we think about it, to be competitive in a global world, it's definitely a team sport.

Problems get solved not by the smartest individual in the room, but by the collective thoughts, solving them together. The important nature of teamwork, collaboration, contribution, accountability of each participant in a solution in a team-based environment is something that's going to be more important going forward.

CHANGING NATURE OF WORK AND THE WORKFORCE

According to Laura Bottomley, the director of Engineering Education at North Carolina State University, "engineer" needs to be redefined away from "someone that does a lot of math" to someone who solves problems using knowledge from a variety of domains. This redefinition is critical for our students as they navigate the evolving workplace.

Brian Novoselich, Associate Professor, Director of Strategic Plans and Assessment (G5) for the United States Military Academy at West Point

One big shift is in talent management. The way we think about managing talent in the engineering profession is going to be critical and needs greater emphasis because the workforce is starting to age out. We as a profession have well-recognised, persistent barriers to entry for a lot of different folks for many different reasons. Any lingering barriers to entry and persistence – we need to get rid of them, because we need all folks in the workforce. With the increased demand for STEM-related career fields and the talent to go into them, we need to work together to make sure we can fill the jobs moving forward.

Sreyoshi Bhaduri, Senator at the Society of Women Engineers and Research Scientist at Amazon

The changing nature of work and the workforce is not incremental - the ecosystems of the past are being questioned and completely overhauled to give way for the new due to several parallel disruptions. There are several factors at play and flexibility seems to be a primary driver. Technology is being increasingly leveraged to connect global teams and deliver results asynchronously. Consequently, skills have evolved. What it meant to be a software development manager 10 years ago is very different from what the role may entail today as a manager of global teams.

José Torero, Professor of Civil Engineering and DH of Civil, Environmental and Geomatic Engineering at UCL, UK

I've read a lot of Alvin Toffler's work and he has one quote that I find absolutely brilliant about tomorrow's illiterate: "The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn."

Our lifelong learners are part of every definition of engineer we need to create. We need to change the way in which we look at engineering education, and make it a partnership between the academic world and the students in a manner such that we give them agency and enable them to become lifelong learners. The evolution of technology is too fast and the amount of knowledge that they have access to now is too large. Unless they know how to learn, our students will become very rapidly obsolete.

HOLISTIC STUDENT SUPPORT

Working with today's students goes beyond lectures in the classroom; each student requires individualized support that reflects their specific needs and backgrounds. In addition, students must learn those interpersonal skills that are essential to any career.

Courtney Smith-Orr, Teaching Assistant Professor, Electrical and Computer Engineering, UNCC

What I'm also noticing more, is COVID has made more apparent the inequities of incoming students' education. I have some students who say, "I want to do this advanced motion detection training," and I have other students who ask what classes they should take.

They have access to very different types of things based on where they are from, or resources their high schools have. When you get them at the college level, the patience and resources required to meet the needs of both types of students has evolved. Additionally, the level of involvement that universities are having with K-12 needs to expand to aid in preparing our future students for engineering careers.

Patrick Cunningham, Associate Professor of Mechanical Engineering, Rose Hulman Institute of Technology

As I've studied the learning process, recognizing how complex the space is with each student bringing an individual preparation, individual background, individual contexts, and any of the factors from that can impact their ability to engage in the classroom, or as a professional, can affect their ability to perform, whether in the military or in the workforce, whether it's in engineering or otherwise. It's knowing how to work best with themselves and to be able to function healthily and productively. I think that greater awareness, being able to teach and help students to have those skills, and even to model those in the education process to make it a welcoming and supportive environment for everyone to grow, not just particular individuals.

Brian Novoselich, Associate Professor, Director of Strategic Plans and Assessment (G5) for the United States Military Academy at West Point

If we look at climate change and global threats to security, we really need to engineer solutions across disciplines that are resilient to transnational threats – we need to design resiliency into our systems moving forward. The question then becomes: how do we train engineers to have empathetic design thought? Thought that takes both really refined people skills, and the ability to identify all the different ways that a system or product needs to be resilient.

Anne Waldmiller, Business Control Manager at Wells Fargo

I don't know if it's new or different necessarily, but when you go outside of traditional manufacturing, or perhaps an engineering career, it's the soft people skills I think are really important. It's going to raise our students up a level and differentiate them from other other candidates. Being able to lead projects, putting yourself in the shoes of your customers – those soft people skills versus traditional, linear engineering skills.

Sreyoshi Bhaduri, Senator at the Society of Women Engineers and Research Scientist at Amazon

Thinking about supporting students should also include learners in the industry, looking to transition into newer roles, upskill, or advance in their careers. Whether it is through certification courses, part-time degrees, non-traditional learning paths are becoming increasingly common. As engineering educators we have an opportunity to provide support to a diverse range of learners and needs, to best equip everyone for a changing economy and workforce.

LEADERSHIP & DECISION MAKING

Engineering students tend to be natural leaders. Building on that innate talent with thoughtful training and experience, they can grow into individuals who not only lead, but also drive change and success.

Ken Walker, Partner & Portfolio Chairman, Falfurrias Capital Partners

I would say the shift we've seen and continue to see is the global nature by which business is being run and will be run in the future. Decisions around where products get produced, and how they get made; decision points around how to invest for innovation, quality, safety, etc.

These are all points that I think are paramount in leadership of larger manufacturing companies. I think having engineers understand not only how to think about building and scoping projects, but also the tides of business and decisions made around those points is something that will be additive to their position to their work and development going forward.

Rick Albee, Hiller Avenue Partners, LLC

What I have found through the years is that engineers tend to rise into positions of leadership, because they're smart people and they're willing to take some initiative. Unfortunately, many of the folks who rise up as leaders get there and have a tendency to communicate poorly, and some of them have a very difficult time influencing, or leading people.

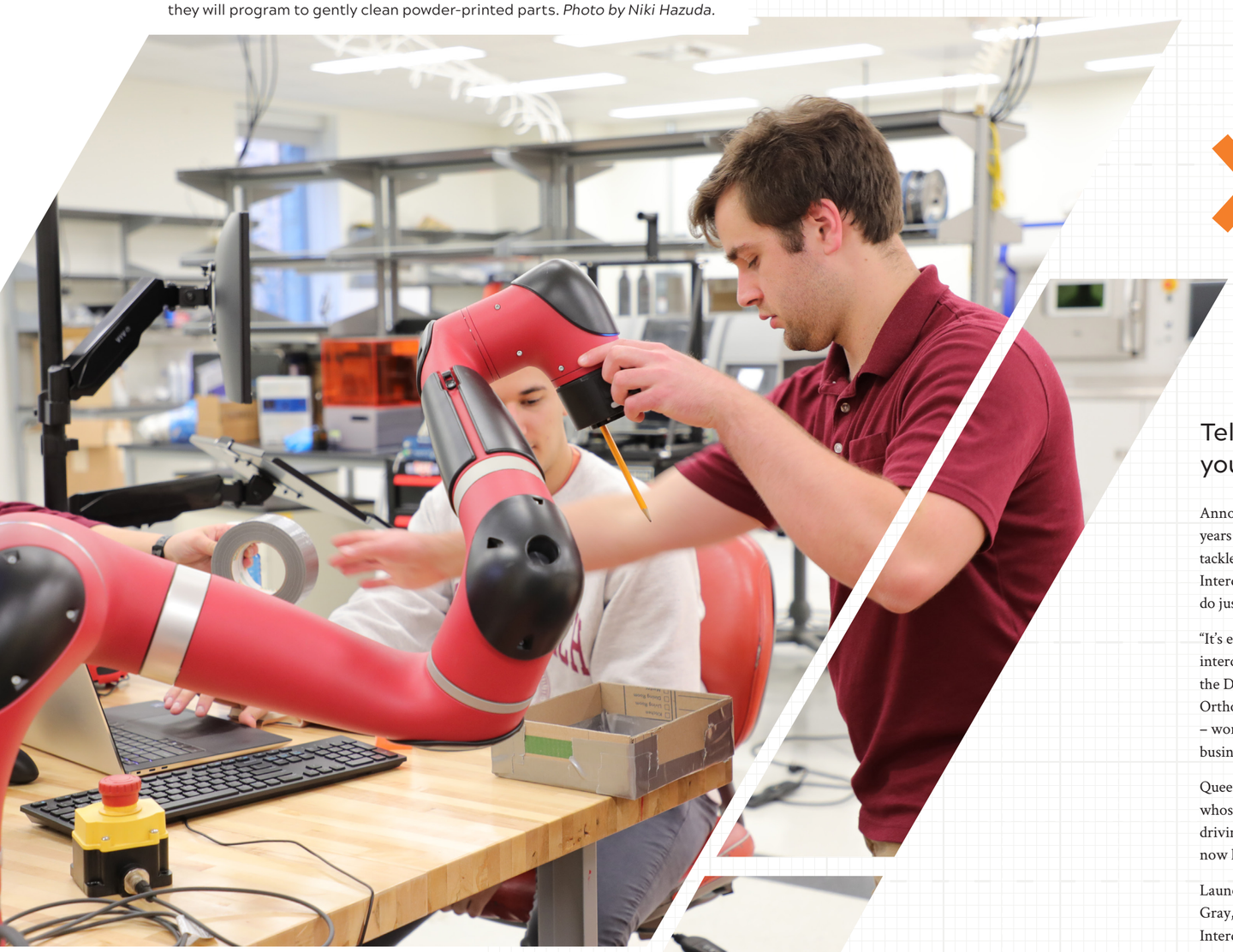
Leadership guru Patrick Lencioni says the point of leadership is "to mobilize people around what is most important." The whole area of leadership is vitally important, and part of this is thinking about what life and success looks like after college.

WATCH

Watch the video about the Harding Street Hydroponics team at bit.ly/IDCHarding

Engineering for the › real world

Students from the Azoth 3D de-powdering team work with a robotic arm they will program to gently clean powder-printed parts. *Photo by Niki Hazuda.*



Article written by Niki Hazuda and originally published on VtX on September 13, 2022.

Tell first-year engineering students they need to work in teams, and you'll most likely be met with a chorus of groans.

Announce that same thing to the same group of students three years later, and they'll jump at the chance, particularly if they can tackle real-world problems. In the College of Engineering's newest Interdisciplinary Capstone course, senior engineering students can do just that.

"It's essential for engineering students to see collaboration and interdisciplinary work modeled," said Robin Queen, professor in the Departments of Biomedical Engineering and Mechanics and Orthopaedic Surgery. "It's what they'll be faced with when they leave – working not just with other engineers, but also co-workers on the business side."

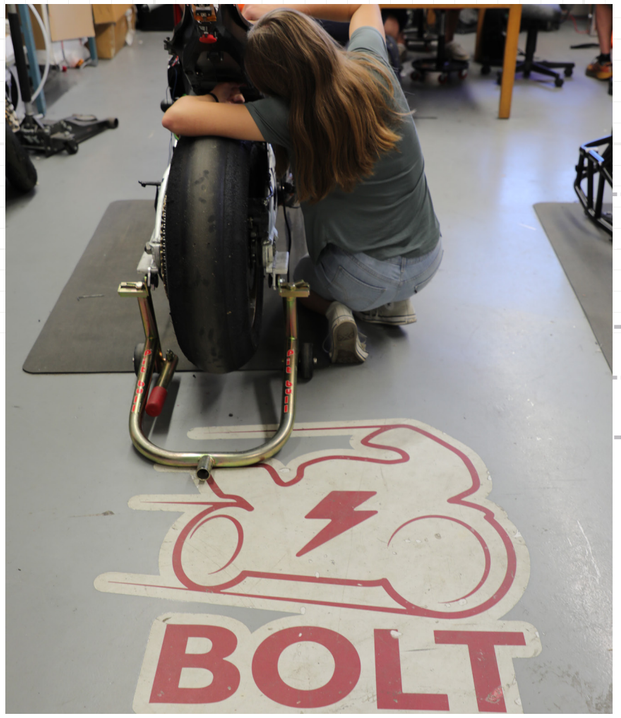
Queen, director of the Kevin P. Granata Biomechanics Lab and whose own career defines interdisciplinary engineering, was a driving force behind the Interdisciplinary Capstone course (IDC), now homed in the Department of Engineering Education.

Launched this fall as an approved course and directed by David Gray, collegiate assistant professor in engineering education, Interdisciplinary Capstone is a unique two-semester course designed to bring together students from across the College of Engineering. This year, nearly 100 senior engineering students will partner on industry projects with Lockheed Martin, the Commonwealth Center for Advanced Manufacturing, or the Virginia Department of Transportation. They will work in competition teams such as BOLT and Hokie Electric Vehicle and on the solar car and auto-drive teams.

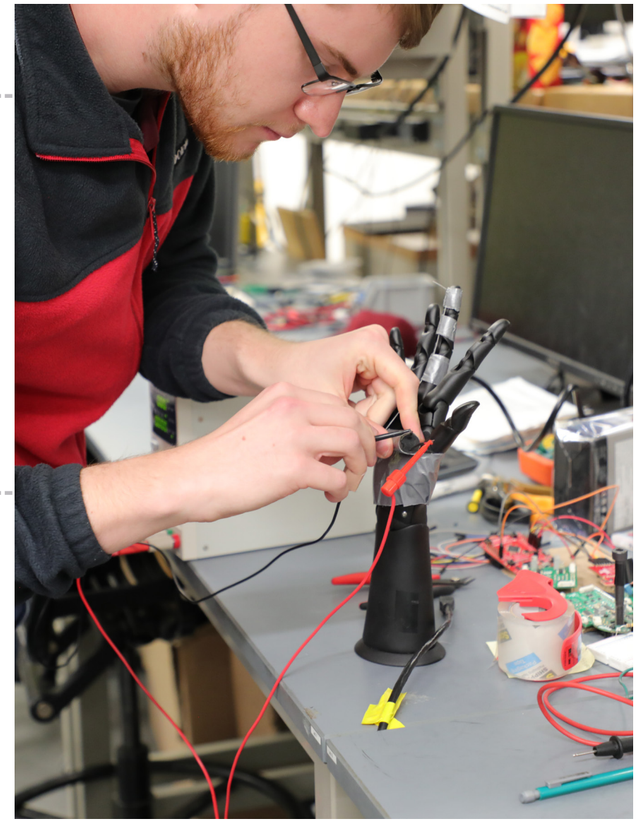
"For the vast majority of their courses, the students are very segmented," said Gray, "where they're given problems with closed solutions, and a right or wrong answer. In IDC, we're saying there's virtually infinite paths to a solution. Students need to use their experience, and as a team, pull in all the different lessons they've learned to make something tangible."

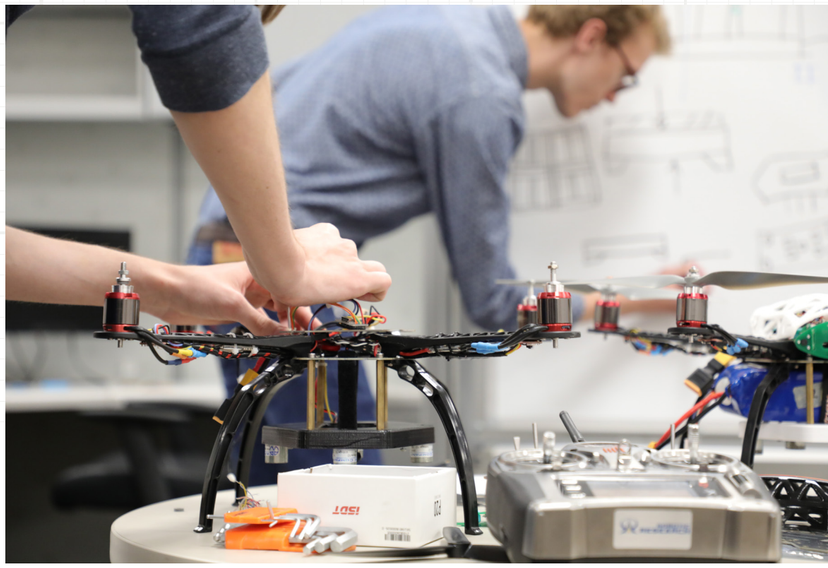
Cultivating these teams requires behind-the-scenes work across the college, with individual students selecting Interdisciplinary Capstone projects when registering for the course. Gray and his fellow department capstone faculty (from mechanical, electrical and computer, industrial and systems, biomedical, mechanical, and material sciences engineering) then accept those students who fill the needs of the specific industry teams.

Competition teams are selected for the Interdisciplinary Capstone based on best fit with instructors and resources.



Students from the Interdisciplinary Capstone work either in a competition team, such as BOLT (direct right), or in an industry team, like the Autonomous Drone team for Lockheed Martin (opposite page). Below, students from the Robotic Prosthetic Hand team work to develop a unique prosthetic for a family member of their team. *Photos by Niki Hazuda.*





> "It will go to a larger pool of Hokie engineering talent that will pay them back down the road just by raising the bar of who a Virginia Tech engineer is."

The course emulates the real-world structure of engineering, demanding high-level communication and partnership from students of all engineering disciplines, from industrial and systems to biomechanical to electrical engineering, while meeting project milestones.

The Interdisciplinary Capstone format also fulfills the vision of Robin Ott, associate professor of practice in mechanical engineering, when discussions for a cross-college capstone course began nearly six years ago. As an engineer with 20 years' industry experience, Ott is invested in prepping engineering students for collaborative careers.

"In mechanical [engineeering], roughly 85 percent of the students go straight into industry, and 15 percent continue onto grad school," she said. "We as educators need to truly prepare students. Every company I've ever worked for has interdisciplinary teams, and so we must expose them to interdisciplinary teamwork."

Whether in the mechancial engineering senior design courses she teaches – which were the foundation for the two-year pilot of the Interdisciplinary Capstone that started in fall 2020 – or the Interdisciplinary Capstone itself, Ott views the industry connections students can make through capstone courses as instrumental exposure.

Queen agrees, highlighting the feedback she received from industry partners during the Interdisciplinary Capstone pilot.

"The industry experts came back and said the course is an invaluable experience for these students to have while they're in school. They'll understand how to do the work asked of them when hired into the companies and asked to do the same thing," Queen said. "The industry partners were also very impressed with the students and the work they were able to produce during the year-long course."

The Interdisciplinary Capstone also presents a unique opportunity for industry partners to preview the curriculum and guide the next generation of Hokie engineers.

"Lockheed Martin was very happy with some of the risk management we did last year, and they asked us to make sure we bring that back for this year," Gray said. "So, as we build this relationship together, they have a path to influence a little bit of what the curriculum could be and share what they are looking for in future employees."

Recent survey data from the National Association of Colleges and Employers identify problem-solving and analytical skills and the ability to work in a team as the top three attributes preferred in future college graduates. Through capstone connections, like the Interdisciplinary Capstone or Ott's senior design classes, industry partners benefit from the potential employee connections, student creativity, and mentorships.

"It's almost like an altruistic payback to education they're doing," Gray said. "But it will go to a larger pool of Hokie engineering talent that will pay them back down the road just by raising the bar of who a Virginia Tech engineer is."

Queen, a fellow of the American Institute for Medical and Biological Engineering, anticipates raising the bar for the Interdisciplinary Capstone course, as well. Despite having spent more than half a decade in deliberation and documentation for the Accreditation Board for Engineering and Technology, Queen views the course as only the first step of interdisciplinary connection for engineering students.

"I would love for the course to be interdisciplinary outside of the college," she said, "because, ultimately, when our students leave Virginia Tech, they're going to be asked to work in teams across a variety of backgrounds."

She sees the natural synergy between engineering and the Pamplin College of Business. Whether discussing marketability, pushing product design, or conducting market analysis, the business perspective can help answer the "big questions" of real-world engineering.

"Giving students the opportunity to work on those communications skills and gain an appreciation of how to can explain what they're doing to non-engineers — those are incredibly important and marketable skills for employment," Queen said.

Changing the face of engineering education

Seven faculty members at a time

With backgrounds in chemical, biomedical, electrical, and materials, our seven newest faculty in Engineering Education represent the ever-changing spectrum of engineering experience at Virginia Tech!

Thanks to support from Dean Julia Ross and the College of Engineering, our team has increased capacity for research, mentoring our Ph.D. students and growing the next generation of Hokie engineers.

Meet our newest team members. ›

Dr. Mark Huerta

Research Interests: STEM learning environments; Mental health and well-being; Team and group dynamics; Graduate student mentorship; Faculty development; and Design education and project-based learning

Dr. Mark Huerta is an Assistant Professor in the Department of Engineering Education at Virginia Tech (VT). In his role, Dr. Huerta aspires to enhance the culture of engineering education and ensure students develop the professional skills they need to be successful in the future workforce. He was previously a Visiting Assistant Professor at VT before transitioning to his current role. Prior to his time at VT, Dr. Huerta was a Lecturer within the Fulton Schools of Engineering at Arizona State University (ASU) for two years. He was recognized for his teaching efforts with a 2020 Top 5% Teaching Award at ASU. He earned his BS and MS in Biomedical Engineering and PhD in Engineering Education at ASU.

Dr. Huerta also has a passion for humanitarian engineering and serving his community. He serves as Chairman of 33 Buckets, a non-profit organization that he co-founded, which develops sustainable clean water solutions within underserved, rural communities in the Global South. His leadership role in 33 Buckets has led to numerous awards including the Pritzker Prize Top 5 Finalist for Emerging Environmental Genius, and Tempe Sister Cities "Making a World of Difference" Award. In his Lecturer role at ASU, he co-directed the Engineering Projects in Community Service (EPICS) program and was the lead instructor for the Global Resolve program at ASU. These experiences have helped shaped his teaching philosophy and interest in designing experiential, authentic, and project-based learning experiences.

Dr. Dayoung Kim

Research Interests: Ethics and Innovation in Engineering; Engineering Practice; Regulation and Policy; and Workforce Development

Dr. Dayoung Kim is an Assistant Professor in the Department of Engineering Education (College of Engineering) at Virginia Tech. She is broadly interested in the practice of engineers in various employment settings and its interactions with the social, economic, and political contexts where their practice is embedded. Especially interested in the ethical and innovative practice of engineers, she tries to answer questions like, how best to support the innovative and ethical practice of engineers in business settings through education and science & technology policy.

She received her Ph.D. in Engineering Education at Purdue University (2022) and received her B.S. and M.S. in Chemical Engineering at Yonsei University (2017) and Purdue University (2021) respectively. During her doctoral study, she received the 2022 Christine Mirzayan Science & Technology Policy Graduate Fellowship from the National Academies of Sciences, Engineering, and Medicine and the 2022 College of Engineering Outstanding Research Award from Purdue University. She was also a Bilsland Fellow of the College of Engineering at Purdue University when she was a Ph.D. student.

Dr. Sarah L. Rodriguez

Research Interests: Equity, access, and retention for engineering and computing; STEM identity & Intersectionality; Latina/o/x students; and Community colleges

Sarah L. Rodriguez is an Associate Professor of Engineering Education and an affiliate faculty member with the Higher Education Program at Virginia Tech. In her research, she concentrates on identifying and asking urgent questions about systemic inequities such as racism, sexism, and classism that marginalized communities experience as they transition to and through their engineering and computing higher education experiences.

Dr. Rodriguez has established a national reputation as a talented grant-maker, research team leader, and collaborator. She has collaborated on 10 large-scale interdisciplinary research projects sponsored by the National Science Foundation (NSF), the Kapor Center, and the Center for the Study of Community Colleges, totaling approximately $20M collectively.

She has published 40 peer-reviewed articles in outlets such as Journal of Women and Minorities in Science and Engineering, Engineering Studies, Journal of Hispanics in Higher Education, Journal of Diversity in Higher Education, and Community College Review as well as authored a host of book chapters and research/policy briefs. Dr. Rodriguez has delivered a multitude of peer-reviewed papers/presentations at national and state conferences, such as the American Society for Engineering Education (ASEE), Frontiers in Education (FIE), the Association for the Study of Higher Education (ASHE), the American Educational Research Association (AERA), and the Council for the Study of Community Colleges (CSCC).

Dr. Susan Sajadi

Research Interests: Broadening Participation in Engineering; Diversity, Equity and Inclusion in Engineering; Engineering Education and Workforce Development; Engineering Workplace and Team Dynamics; Fostering Adaptability; Engineering Culture and STEM Education

Susan Sajadi is an Assistant Professor at Virginia Tech in the Department of Engineering Education. She has a Ph.D. in Engineering Education Systems and Design from Arizona State University. She also has a B.S.E. and M.S. in Biomedical Engineering and previously worked as a biomedical engineer at WL Gore and other technology companies. In addition, Susan has experience working in STEM education, humanitarian engineering, and corporate social responsibility.

Dr. Michelle Soledad

Research Interests: Undergraduate learning and teaching experiences; Large fundamental engineering courses; Faculty and student motivation; Faculty development and support programs; and Data-informed reflective teaching practices

Michelle Soledad, Ph.D. is a Collegiate Assistant Professor in the Department of Engineering Education at Virginia Tech. Her research and service interests include teaching and learning experiences in fundamental engineering courses, faculty development and support initiatives – including programs for the future engineering professoriate, and leveraging institutional data to support reflective teaching practices.

She has degrees in Electrical Engineering (B.Sc., M.Eng.) from the Ateneo de Davao University in Davao City, Philippines, where she previously held appointments as Assistant Professor and Department Chair for Electrical Engineering. She also previously served as Director for Communications and International Engagement at the Department of Engineering Education at Virginia Tech; Lecturer at the Department of Engineering Education at The Ohio State University; and Assistant Professor at the Department of Integrated Engineering at Minnesota State University, Mankato. Prior to embarking on a career in academia, Michelle worked for Accenture as a software engineer and project manager. She holds a Ph.D. in Engineering Education from Virginia Tech.

Dr. Cassie Wallwey

Research Interests: Engineering Student Motivation; Engineering Student Success; Feedback in Engineering Classrooms; and Exclusion in Engineering

Cassie Wallwey, Ph.D. is a Collegiate Assistant Professor in the Department of Engineering Education at Virginia Tech. Her research interests include studying effective feedback in engineering and mathematics courses, improving engineering student motivation and success, and understanding exclusion in engineering to help confront its weed-out culture.

Cassie has her Ph.D. in Engineering Education from Ohio State University, where she worked as a Graduate Research Assistant and Graduate Teaching Associate, primarily teaching first-year engineering and engineering mathematics. She also has both a B.S. and M.S. in Biomedical Engineering from Wright State, where she also worked as a Graduate Teaching Associate for an engineering mathematics course.

Dr. Qin Zhu

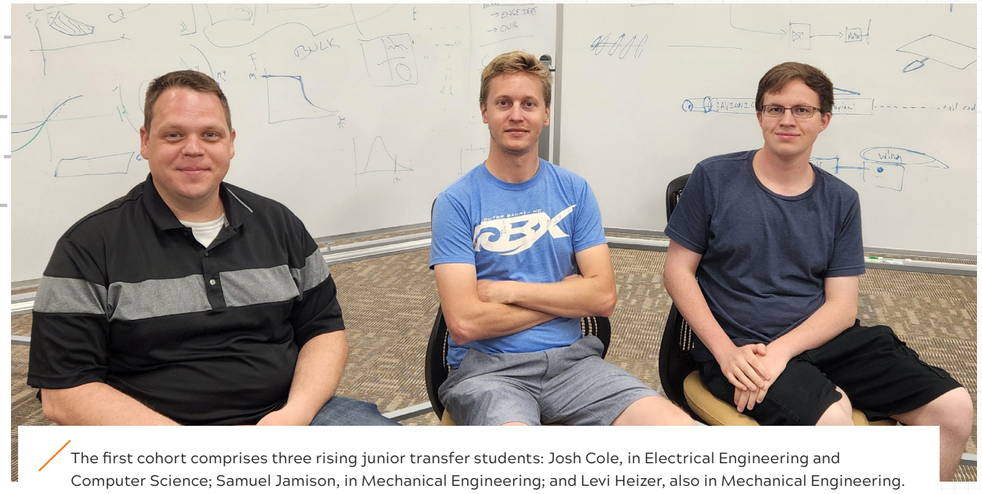
Research Interests: Global and international engineering education; Engineering ethics; Engineering cultures; and Ethics & policy of computing technologies and robotics

Qin Zhu is Associate Professor in the Department of Engineering Education at Virginia Tech. He holds a Ph.D. in Engineering Education from Purdue University and a Ph.D. in Philosophy of Science and Technology (Engineering Ethics) and a BS in Materials Engineering from Dalian University of Technology, China. Dr. Zhu's major interests include the cultural and critical studies of engineering education, engineering ethics, global and international engineering education, and ethics and policy of AI and Robotics.

READ

Explore our new faculty's publications and grants at enge.vt.edu/People.html

Rising up to research real-world impacts for Virginia Tech's Climate Action Commitment



The first cohort comprises three rising junior transfer students: Josh Cole, in Electrical Engineering and Computer Science; Samuel Jamison, in Mechanical Engineering; and Levi Heizer, also in Mechanical Engineering.

What makes a Virginia Tech summer?

Maybe it's a hot, sunny day paired with a scoop of ice cream from Sugar Magnolia; or the campus tours of first-year students eagerly getting to know their new home; or maybe it's a four-mile hike to iconic McAfee Knob.

For three rising juniors, summer at Virginia Tech is researching environmental impacts on behalf of the university's Climate Action Commitment through Engineering Education's new summer internship program, RISE-UP (Research, Internships, Service, Experiences - Ut Prosim).

Led by Jennifer Benning, instructor in Engineering, the first RISE-UP cohort comprises Josh Cole, in Electrical Engineering and Computer Science; Samuel Jamison, in Mechanical Engineering; and Levi Heizer, also in Mechanical Engineering, (all students from the VT NETS program).

With their project partner Engineering Services (part of the Campus Planning, Infrastructure, and Facilities), the team is conducting research on asset management, zero net energy, and Virginia Tech's own energy mix to help the university achieve its goal of becoming a leader in climate action.

Get to know Sam, Josh and Levi with our Q&A!

Why RISE-UP?

S: I have been looking for a way to get practical experience that will help in my career later on. It has also been beneficial to me to contribute to research that will be used and can make a difference, rather than merely solving problems that were generated to teach a concept.

J: When I received the VT-NETS scholarship they told us that one summer they would grant us the opportunity to conduct research at the university, so I've always had that in the back of my head since my time at community college. Before the pandemic, I was already curious as to how academic research was conducted, and after I was definitely curious! For me, this was the best summer to do it. So I filled out the application with Dr. Lee and VT-NETS and I was placed in RISE-UP!

L: I'm interested in the automotive industry and greenhouse gases are a big part of new automotive developments.

What are you most excited for with RISE-UP? What are you excited to learn?

S: This one is difficult because I look forward to a lot of different elements of it. Although I do look forward to continuing to work with my peers on this project, getting to know them better, and presenting my project, I am most excited for being able to interact with the professor on an individual level with specific feedback, as opposed to a group/classroom setting as in the semester.

J: I didn't know much about what I was gonna do but I was happy that it was about climate change. I keep hearing mixed things about it so I'm looking forward to diving into it and learning more!

L: I'm excited to learn about agrivoltaics and how we can realistically power the university entirely with renewables.

What aspect of RISE-UP research are you leading? What about this research appeals/speaks to you?

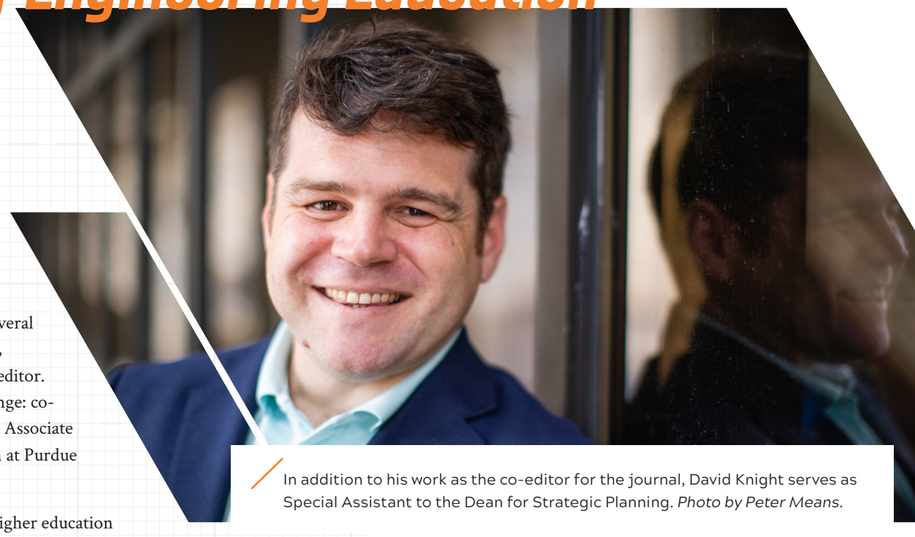
S: I am working on research to assist the university in the development of a zero net energy building by 2026. This project has challenged me to grow in knowledge and scope compared to what I have done in the past. Seeing so many creative and varying solutions that have been explored in the past for this problem has also been a particularly fascinating element of my research.

J: I am leading the Asset Management project. It's probably the least interesting one for the layperson, but I think it's the most important one. While it doesn't directly deal with all the more popular green technologies like wind turbines, it does lay the foundation for them to exist on our campus. Good Asset Management is going to give us the resources to be able to implement and integrate things like solar panels or zero-net-energy buildings onto our campus. I like to think of Asset Management as the bridge between our good ideas and intentions around climate change to the challenges we must face to make those ideas a reality.

L: I'm working on the energy mix that Virginia Tech uses to power campus. I like that a lot of problems we have are essentially really big thermodynamic problems.

Article written by Niki Hazuda and originally published on the ENGE website.

David Knight Named Co-Editor of the *Journal of Engineering Education*



In addition to his work as the co-editor for the journal, David Knight serves as Special Assistant to the Dean for Strategic Planning. *Photo by Peter Means.*

David Knight, Associate Professor in Engineering Education at Virginia Tech, has been a part of the Journal of Engineering Education (JEE) for several years, serving as an associate editor, senior associate editor, and deputy editor. In January, he'll tackle a new challenge: co-editor-in-chief with Joyce Main, an Associate Professor in Engineering Education at Purdue University.

Knight, who received his Ph.D in higher education from Penn State University and completed an engineering education postdoctoral fellowship with the School of Civil Engineering at the University of Queensland in Australia, is dedicated to improving and advancing the field of engineering education.

"It's important to help authors move their ideas forward," Knight said. "That's part of this new role that I'm really looking forward to. I love helping researchers build out their ideas, and as co-editors, Dr. Main and I share that mindset."

He and Main have a variety of ideas to begin their role as co-editors, including a big one in particular: analyzing the efficiency of article and paper publications.

The journal process all starts with someone submitting a manuscript submission, followed by editor leaders deciding whether it merits being sent out for external review. If it does, it will go through layers of peer review, and ultimately the editor team will make a decision whether something will be published in the journal.

"We're thinking about the efficiency of our review process," said Knight. "Are there ways we can more quickly move from an initial submission to the time it eventually appears in the journal, while maintaining quality?"

"Additionally, how can we be sure we're being respectful of reviewers by acknowledging they're offering their unpaid time to provide constructive feedback? We want to make sure we are being really intentional about our requests for bringing their expertise to a manuscript."

For Knight, peer review is a critical step in the process for vetting ideas and essential in the knowledge generation process. When considering his own research, he firmly believes peer reviewers have been helpful for enhancing and refining his ideas. Peer-reviewed articles "provide critical evidence and credibility" for ideas that researchers share.

Submitting a paper to a journal like the Journal of Engineering Education can be a daunting task, but Knight believes accepted papers and articles should make a contribution to the field.

"I try to push authors to think about the implications of their work for research, policy, and practice; we want each article to be relevant to the field of engineering education," he said. "My advice for new authors would be to find somebody who has published with JEE previously and work closely with them, learn from them. I firmly believe that mentoring is an important activity in the research process."

Knight also emphasized the value of working as a team. He said oftentimes it's undergraduates and graduate students who come up with the best ideas,"pushing the boundaries of what we know."

He looks forward to formally connecting with his fellow co-editor-in-chief, Main, with whom he shares research interests. And he praised the outgoing editor-in-chief, Lisa Benson who has "done an incredible job leading the journal." He's grateful for the trust in Main and himself regarding this influential position in the field.

"We appreciate that our colleagues have entrusted the leadership of JEE with us and very much look forward to working with and learning alongside the incredibly talented editorial board, our partners at ASEE and Wiley, our colleagues who lead other engineering education journals, and authors, reviewers, and readers from around the world."

Article written by Megan Reese, writing intern for Engineering Education and originally published on the ENGE website.

Transforming

the Graduate Student Experience

Virginia Tech graduate student Jessica Gannon, who joined the Therapeutic Ultrasound and Noninvasive Therapies Laboratory in 2019, was inspired to pursue pancreatic cancer research after her father's death from the disease. *Photo by Peter Means.*

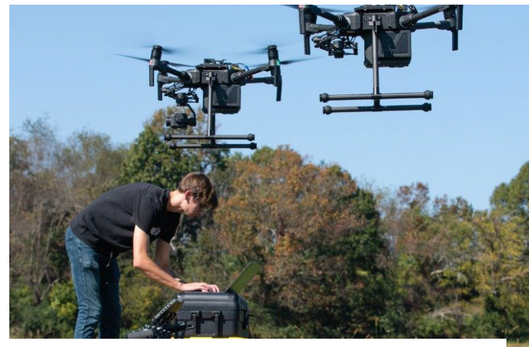
The graduate education system in the College of Engineering resembles a box of unassembled puzzle pieces. From the Center for Enhancement of Engineering Diversity (CEED), to training and professional development opportunities for faculty, to special projects designed to strengthen support for graduate students – each initiative is an essential part of creating an equitable graduate program.

With the support of a $1.2 million organizational transformation grant from the National Science Foundation (NSF), the college will take those pieces and strengthen their connections through the development of Partnerships and Research on the Equity of Graduate Education in Engineering (PROTEGE), focusing on changing the graduate engineering education system by connecting, integrating, and improving numerous processes, in addition to providing support for graduate students.

"20, 30 years ago, there wasn't a universal belief or understanding that it might be the system that's flawed," said Bevlee Watford, the Executive Director of CEED and co-principal investigator (co-PI) on the grant. "Now, we're in a different frame of mind where we're recognizing things like institutional racism, sexism, etc., and seeing that even with all the support in the world, if we don't change the system, we will have to continue providing that support."

Unlike its undergraduate counterpart, graduate education – both at Virginia Tech and across Masters and Ph.D.-granting institutions – operates in a decentralized way. Recruitment, admissions, Ph.D. qualifications, funding and research groups fluctuate across the departments.

"When I think about equity in engineering, it's really about how we look at what we do, how we teach, make decisions," said Julie Ross, the Paul and Dorothea Torgersen Dean of Engineering, and PI for the grant. "Our hope is not that we just close any gaps we may be seeing in terms of outcomes, but we actually elevate the outcomes for all of our students across the college."



LEFT: Industrial & Systems Engineering Ph.D. student, Levern Currie '21, talks through her first speech-independent, gesture-based recognition software for fast food ordering: Drivingo. *Photo courtesy of Levern Currie.* **RIGHT:** Larkin Heintzman, fifth-year Electrical and Computer Engineering doctoral student works with search and rescue drones. *Photo by Peter Means.*

Developing PROTEGE

Though current initiatives are in various stages of progress across the college, the grant unites them under one name and a larger source of funding, which is essential for driving consistent change. According to Ross, the grant enables the college to stay focused, achieve more, and hold the work to a higher level of accountability.

CEED will have a vital role in supporting the backbone of the center, providing organizational structure and facilitating communication across stakeholder groups.

"CEED itself cannot fix this problem," said Walter Lee, associate professor in Engineering Education and co-PI on the Equity in Engineering grant, "Nor should it be expected to fix it. But because it's already been doing a lot of this work, it will be instrumental in making sure everyone's on the same page."

In addition to the team within CEED and across the college, PROTEGE will be supported by an interdisciplinary group of faculty:

- Holly Matusovich, Associate Dean for Graduate & Professional Studies, COE, and professor, Engineering Education;
- Bevlee Watford, Associate Dean for Equity and Engagement, COE; Executive Director, CEED; professor, Engineering Education;
- David Knight, associate professor, Engineering Education, and special assistant to the Dean for strategic plan implementation;
- Walter Lee, associate professor and assistant department head for graduate programs, Engineering Education;
- Tremayne Waller, Director of Graduate Student Programs, CEED;
- Homero Murzi, assistant professor, Engineering Education;
- Mark Huerta, assistant professor, Engineering Education;
- Jeremi London, associate professor, Engineering Education; and
- Frederick Paige, Assistant Director Virginia Center for Housing Research, The Charles E. Via, Jr. Department of Civil and Environmental Engineering.

Over the next two years, the college will examine every element of the graduate process; interview graduate students; and connect with stakeholders, which includes faculty throughout COE. Due to the "homegrown" processes of each engineering department, faculty and department buy-in is critical.

"Grants come and go," said Ross. "Deans come and go. Department heads come and go. Provosts come and go. If there's not buy-in from grassroots levels, you can't be successful in the long term. Even if you put some change in place, you can't sustain it."

Often, faculty engage in the graduate admissions or recruitment process when they're searching for a student to fill their own lab positions. No open positions can lead to less faculty involvement. According to Watford, this impedes an equitable treatment of student applications.

"Faculty should be concerned about the qualifications of every single student that comes into their department," said Watford. "They're not necessarily focused on the overall benefit to the department, or the rankings or stature. But we've created that culture. They didn't go rogue – this is the way it was created, and that's a problem."

Going Beyond Virginia Tech

Remodeling graduate education at Virginia Tech impacts the field of engineering itself. Increasing the diversity of student backgrounds and developing the best education and training leads to a highly skilled workforce, both in academia and industry.

I care about this issue because I care about our students and because the world needs us to care about this issue," said Ross. "If engineers are going to do the work we need them to do – there are really big, complicated problems out there – we can't do that if we're relying on a very small group of people to solve those problems."

According to Ross, who champions the college's strategic plan built on equity of access, education and resources, our unique blend of engineering and education expertise serves as a platform for leading national change.

"If we can figure out how to do it at Virginia Tech, other large research-intensive institutions can figure out how to do it," she said. "And that's the kind of thing that can really move the needle for the profession."

Article written by Niki Hazuda. Originally published on VtX.

PUBLICATIONS

Artiles, M., & Matusovich, H. (2022). **Doctoral Advisor Selection in Chemical Engineering: Evaluating Two Programs through Principal Agent Theory.** Studies in Engineering Education, 2(2), pp. 120–140.

Artiles, M.S., & Matusovich, H.M. (2022) **Choosing a Doctoral Advisor: A Study of Chemical Engineering Students? Perspectives Using Basic Needs Theory.** International Journal of Engineering Education 38(5), 1212-1222

Benning, J., Shearer, C., Kellogg, S., & Oakes, W. (2022). **Impact of Service Learning on Engineering Student Development.** International Journal of Engineering Education 38(1), 253-263.

Boyd-Sinkler, K. E., Holloman, T. K., Pee, C. M., Lee, W. C., & London, J. S. (2022). **Black Students in Undergraduate Engineering Programs: A Qualitative Systematic Review.** Journal of Negro Education, 91(1), 112-124.

Case, J., & Blackie, M. (2022). **Engineering Education Research for educational change: the possibilities of critical realism for conceptualising causal mechanisms in education.** Southern Journal of Engineering Education, 1, 61-74.

Case, J. M., & Heydenrych, H. (2022). **A New Chemical Engineering Curriculum for a New South Africa: Assessing the Impact of Duncan Fraser's Three Decades of Educational Research and Reform.** Process Integration and Optimization for Sustainability, 1-14.

Case, J. M., & Marshall, D. (2022). **Knowledge-building in higher education research: analysing the work of a South African scholar, Suellen Shay.** Teaching in Higher Education, 27(8), 962-978.

Clancy III, R. F., & Zhu, Q. (2022). **Global Engineering Ethics: What? Why? How? and When?.** Journal of International Engineering Education, 4(1), 4.

Davis, K., Deters, J., Ozkan, D., Davis, J., & Murzi, H. (2022). **Exploring the Process and Outcomes of Leading a Study Abroad Program Using Real-Time Perspectives.** Frontiers: The Interdisciplinary Journal of Study Abroad, 34(2), 351-381.

Davis, K., Sanderlin, N., & Knight, D. (2022). **Applying Organizational Lenses to Understand the Potential for International Research Experiences for Students to Catalyze Broader Internationalization.** The Internationalisation of Higher Education and Research, 3, A.2.1-10.

Deem, R., Case, J. M., & Nokkala, T. (2022). **Researching inequality in higher education: tracing changing conceptions and approaches over fifty years.** Higher Education, 84(6), 1245-1265.

Denton, M., Borrego, M., & Knight, D. B. (2022). **US postdoctoral careers in life sciences, physical sciences and engineering: Government, industry, and academia.** Plos one, 17(2), e0263185.

Deters, J., Holloman, T. K., Grote, D., Taylor, A. R., & Knight, D. (2022). **Critically Examining the Role of Habitus for Minoritized Students in a Global Engineering Program.** Frontiers: The Interdisciplinary Journal of Study Abroad, 34(4), 172-205.

Espino, M. L., Rodriguez, S. L., & Le, B. D. (2022). **A systematic review of literature: Engineering identity and students with financial need in community colleges.** Community College Journal of Research and Practice, 46(5), 352-363.

Francis, R. A., Paretti, M.C., & Riedner, R. (2022). **Theorizing Engineering Judgment at the Intersection of Decision-Making and Identity.** Studies in Engineering Education, 3(1), 79–98.

Froehle, K., Dickman, L., Phillips, A. R., Murzi, H., & Paretti, M. (2022). **Understanding Lifelong Learning and Skills Development: Lessons Learned from Practicing Civil Engineers.** Journal of Civil Engineering Education, 148(4).

Grote, D. M., Richardson, A. J., Glisson, H. E., Knight, D. B., Lee, W. C., & Watford, B. A. (2022). **Engineering community college transfer pathways through pre-transfer programs.** New Directions for Community Colleges, 2022(198), 77-91.

Howland, S. J., Kim, D., & Jesiek, B. K. (2022). **Senior engineering students' Reflection on their learning of ethics and morality: A qualitative investigation of influences and lessons learned.** International Journal of Ethics Education, 7(1), 171-199.

Huang, W., London, J.S., Perry, L.A. (2022). **Project-based Learning Promotes Students' Perceived Relevance in an Engineering Statistics Course: A Comparison of Learning in Synchronous and Asynchronous Learning Environments.** Journal of Statistics and Data Science Education, 00(0), 1-9.

Huerta, M., London, J., & Mckenna, A. (2022). **Engineering Deans' Perspectives on the Current State of Faculty Development Programs in Engineering Education.** International Journal of Engineering Education, 38(4), 1073-1091.

Jalali, Y., Matheis, C., & Lohani, V. K. (2022). **Imagination and Moral Deliberation: A Case Study of an Ethics Discussion Session.** International Journal of Engineering Education, 38(3), 709-718.

Katz, A., & Main, J. (2022). A**pplying Concepts from Political Science and Economics to Advance the Study of Engineering Education.** Studies in Engineering Education, 3(1), 28–52.

Kim, D., Jesiek, B. K., & Mazzurco, A. (2022). **Development and validation of the sojourn readiness assessment (SRA): Exploratory and confirmatory factor analysis and translation to Chinese.** International Journal of Intercultural Relations, 88, 95-105.

Read the Research breakdowns on LinkedIn at **VIRGINIA TECH ENGINEERING EDUCATION**.

FOLLOW

Klassen, M., & Case, J. M. (2022). **Productive tensions? Analyzing the arguments made about the field of engineering education research.** Journal of Engineering Education, 111(1), 214-231.

Lee, W. C., Hall, J. L., Godwin, A., Knight, D. B., & Verdín, D. (2022). **Operationalizing and monitoring student support in undergraduate engineering education.** Journal of Engineering Education, 111(1), 82-110.

Lee, W. C., & Rodriguez, S. L. (2022). **Reimagining STEM Higher Education Research: Part 1.** Journal of Women and Minorities in Science and Engineering, 28(2), v-ix.

Lim, T. C., Wilson, B., Grohs, J. R., & Pingel, T. J. (2022). **Community-engaged heat resilience planning: Lessons from a youth smart city STEM program.** Landscape and Urban Planning, 226, 104497.

London, J.S., Douglas, E.P., Loui, M.C. (2022). **"Guest Editorial: Introduction to the Special Themed Section on Engineering Education and the COVID-19 Pandemic."** Journal of Engineering Education, 111(2), 275-276.Accessible at: http://doi.org/10.1002/jee.20457

London, J. S., Lee, W. C., Watford, B. A., Ash, C. H., Holloman, T., Pee, C. M., & Hampton, C. (2022). **Climbing Uphill: Toward a Common Agenda for the Advancement of Black Americans in Engineering.** Journal of Women and Minorities in Science and Engineering, 28(3), 101-118.

McArthur, J., Blackie, M., Pitterson, N., & Rosewell, K. (2022). **Student perspectives on assessment: connections between self and society.** Assessment & Evaluation in Higher Education, 47(5), 698-711.

McCord, K. H., Ayer, S. K., Perry, L. A., Patil, K. R., London, J. S., Khoury, V., & Wu, W. (2022). **Student Approaches and Performance in Element Sequencing Tasks Using 2D and Augmented Reality Formats.** Education Sciences, 12(4), 247.

Miska, J. W., Mathews, L., Driscoll, J., Hoffenson, S., Crimmins, S., Espera Jr, A., & Pitterson, N. (2022). **How do undergraduate engineering students conceptualize product design? An analysis of two third-year design courses.** Journal of Engineering Education, 111(3), 616-641.

Mogashana, D., Case, J. M., & Williams, K. (2022). **How ADP students navigate enablements and constraints of the programme: an exploration of structure and agency.** South African Journal of Higher Education, 36(2), 204-221.

Norris, M. B., Grohs, J. R., & Knight, D. B. (2022). **Investigating student approaches to scenario-based assessments of systems thinking.** Frontiers in Education, 7. https://www.frontiersin.org/articles/10.3389/feduc.2022.1055403

Novoselich, B. J., & Knight, D. B. (2022). **Measuring a moving target: Techniques for engineering leadership evaluation and assessment.** New Directions for Student Leadership, 2022(173), 63-71.

Ogunseiju, O. R., Gonsalves, N., Akanmu, A. A., Bairaktarova, D., Bowman, D. A., & Jazizadeh, F. (2022). **Mixed reality environment for learning sensing technology applications in Construction: A usability study.** Advanced Engineering Informatics, 53, 101637.

Paradise, T., Chowdhury, T., Davis, K., Murzi, H., & Soledad, M. (2022). **Developing Global Competency Virtually: Student Experiences in a Global Program That Transitioned Online due to the COVID-19 Pandemic.** Frontiers: The Interdisciplinary Journal of Study Abroad, 34(2), 56-80.

Paradise, T., Schilling, M. R., Grohs, J., & Laney, J. L. (2022). **Teacher Experiences in a Community-Based Rural Partnership: Recognizing Community Assets.** Journal of Pre-College Engineering Education Research (J-PEER), 12(1), 3.

Perez, R. J., Motshubi, R., & Rodriguez, S. L. (2022). **" We are a huge source of labor": Exploring STEM Graduate Students' Roles in Changing Departmental Climate.** The Review of Higher Education, 46(1), 33-66.

Rodriguez, S. L., Doran, E. E., Sissel, M., & Estes, N. (2022). **Becoming la ingeniera: Examining the engineering identity development of undergraduate Latina students.** Journal of Latinos and Education, 21(2), 181-200.

Rodriguez, S. L., & Lee, W. C. (2022). **Reimagining STEM Higher Education Research: Part 2.** Journal of Women and Minorities in Science and Engineering, 28(3), v-viii.

Rodriguez, S. L., Perez, R. J., & Schulz, J. M. (2022). **How STEM lab settings influence graduate school socialization and climate for students of color.** Journal of Diversity in Higher Education, 15(1), 58-72.

Smith, N. L., Grohs, J. R., & Van Aken, E. M. (2022). **Comparison of transfer shock and graduation rates across engineering transfer student populations.** Journal of Engineering Education, 111(1), 65-81.

Szöke, M., Katz, A., Borgoltz, A., & Devenport, W. (2022). **Development of Hybrid Laboratory Sessions during the COVID-19 Pandemic.** Advances in Engineering Education, 10(2), 80-100.

Tan, L., Bradburn, I. S., Knight, D. B., Kinoshita, T., & Grohs, J. (2022). **SAT patterns and engineering and computer science college majors: an intersectional, state-level study.** International Journal of STEM Education, 9(1), 68.

Wallwey, C., Longmeier, M. M., Hayde, D., Armstrong, J., Kajfez, R., & Pelan, R. (2022). **Consider "HACKS" when designing hackathon challenges: Hook, action, collaborative knowledge sharing**. Frontiers in Education, 7. https://www.frontiersin.org/articles/10.3389/feduc.2022.954044

West, P., Paige, F., Lee, W., Watts, N., & Scales, G. (2022). **Using Learning Analytics and Student Perceptions to Explore Student Interactions in an Online Construction Management Course.** Journal of Civil Engineering Education, 148(4), 05022001.

Younes, R., & Bairaktarova, D. (2022). **ViTA: A flexible CAD-tool-independent automatic grading platform for two-dimensional CAD drawings.** International Journal of Mechanical Engineering Education, 50(1), 135-157.

Dr. Cheryl Beauchamp

"Exploring Cyber Ranges in Cybersecurity Education"

March 2022

Dr. Alejandro "Andrew" Espera, Jr.

"Through the Lenses of Pedagogical Content Knowledge and Instructor Beliefs: Understanding Engineering Instructors' Enacted Practice"

March 2022

Dr. Tawni Paradise

"Supporting Parent Engagement at Home: Parent Perceptions of Important Knowledge in Educating their Children in Engineering Activities of Varying Structure"

July 2022

Dr. Kai Jun "KJ" Chew

"Exploring Instructors' Classroom Test Beliefs and Behaviors in Fundamental Engineering Courses: A Qualitative Multi-Case Study"

July 2022

Dr. Jessica Deters

"Investigating Student Experiences of Engineering Culture During COVID-19: A Comparative Case Study"

March 2022

Dr. Yousef Jalali

"An Exploratory Study of Research Collaborations between Faculty at HBCUs and PWIs"

April 2022

Dr. Joshua Garcia-Sheridan

"Teacher Pedagogical Choice: Analyzing Engineering Professional Development Programs and COVID in Middle School Science Classrooms"

December 2022

Dr. Teirra Holloman

"Race-conscious Student Support: A Comparative Analysis of Organizational Resilience in Engineering Education"

November 2022

2022 DOCTORATES

Awards & Honors

DEAN JULIE ROSS
2022 Outstanding Woman Leader in Virginia Higher Education

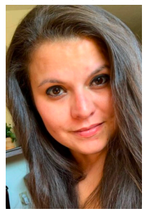
PASSED THE PRELIMINARY EXAM
Amy Richardson, Qualla Ketchum, Yasir Gamieldien, Maya Menon, Carol Geary, Isil Anakok, Karen Martinez Soto, Jazmin Jurkiewicz, Sidd Kumar & Julia Brisbane

DR. DIANA BAIRAKTAROVA
Named to editorial advisory board for the International Journal of Engineering Education

DR. DAVID GRAY
Undergraduate Research Advisor Award

Lynn Nystrom Award (incl. his undergraduate Research Team)

DR. JEREMI LONDON
Promoted to Associate Professor with tenure



ISIL ANAKOK
Edward A. Bouchet Graduate Honor Society Inductee

LISA SCHIBELIUS & KAREN MARTINEZ-SOTO
Named new associate members of VT Graduate Academy for Teaching Excellence

DRS. BEN CHAMBERS & HOMERO MURZI
Dean's Award for Excellence in Teaching

DR. DAVID KNIGHT
COE Outstanding Mentor Award, VT Graduate School

Named Co-Editor of the Journal of Engineering Education

Wickenden Honorable Mention

DR. SARAH BLACKOWSKI
Virginia Tech Graduate School's Teaching Excellence Award, Graduate Instructor of Record

DR. KAI JUN "KJ" CHEW
Dr. Bevlee A. Watford Outstanding Doctoral Student

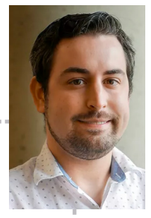
DR. JANICE HALL
Dr. Bevlee A. Watford Outstanding Dissertation Award

DR. MARIE PARETTI
2022 Ronald S. Blicq Award for Distinction in Technical Communication Education

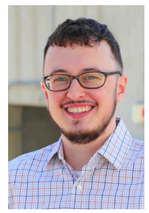
Co-recipient of the Rudolph J. Joenk Jr. Award for Best Paper in the IEEE Transactions on Professional Communication

DR. HOLLY MATUSOVICH
2022 Alumni Award for Excellence in Graduate Academic Advising at Virginia Tech

Appointed as Associate Dean for Graduate and Professional Studies, College of Engineering



DR. DAVID REEPING
2022 Wickenden Honorable Mention



DR. CASSANDRA MCCALL & ADAM MASTERS *(et. al)*
2022 Wickenden Award

DR. BEVLEE WATFORD
The Student Engineers' Council at Virginia Tech endowed a $100,000 scholarship named the Bevlee Watford Inclusion Scholarship for incoming engineering students.

DRS. LISA MCNAIR & CHELSEA LYLES
with Dr. Phyllis Newbill

Alumni Award for Outreach Excellence (Team Achievement)

UNDERGRADUATE SCHOLARSHIPS

2021-22 RECIPIENTS

Anna Walter
Harry New Jones II Scholarship

Kathryn Sloan
H. Powell Chapman, Jr. Award

2022-23 RECIPIENTS

Thomas Lu
Harry New Jones II Scholarship

Zach Lowicki
H. Powell Chapman, Jr. Award

VIRGINIA TECH ENGINEERING EDUCATION NAMED 2022 UNIVERSITY EXEMPLARY DEPARTMENT

Read more at bit.ly/ExcellentENGE

READ

Homero Murzi receives NSF CAREER award

Creating the next generation of engineering education leaders in diversity, equity, and inclusion

Homero Murzi leads faculty development programming in the American Society for Engineering Education and the incoming chair for its Commission on Diversity, Equity, and Inclusion. *Photo by Niki Hazuda.*

The old adage "necessity is the mother of invention" is lived every day in the field of engineering and especially in Homero Murzi's latest National Science Foundation Faculty Early Career Development (CAREER) grant.

Based on his personal experiences with diversity, equity, and inclusion (DEI), Murzi, an assistant professor in the Department of Engineering Education (ENGE), will tackle the issue of building a sustainable system for educating the next generation of leaders in engineering education.

"It came to me that I should be doing work based on what I experienced in my own process, my experiences, and my own challenges adapting to different situations in the U.S. and also trying to make meaningful work in DEI," said Murzi, a recipient of the 2022 Dean's Award for Excellence in Teaching and an ENGE Ph.D. alumnus.

"I've been assuming a lot of DEI leadership roles, and when I think back about how they started, I don't think I was prepared for many of them."

Murzi, who also leads the award-winning Rising Sophomore Abroad Program, brings a unique understanding on how to best educate the next generation of engineers and what global roles they might take on, including in DEI. For Jenni Case, ENGE department head, Murzi's research focus on large engineering institutions is central to changing the status quo of who gets to be an engineer in the United States.

"With many years of teaching in an engineering program in Venezuela as well as industry experience across Latin America, Dr. Murzi's proposed work identifies a key aspect of DEI work that's not yet well understood or supported — that of the role and impact of leaders who hold particular institutional roles in relation to DEI," said Case.

Murzi will begin by interviewing leaders across multiple roles, identities, and university communities in engineering programs across the country with the aim of discovering how the individuals assumed those roles; how they think and make their decisions; and even how their perceptions, values, and lived experiences influence those decisions.

Murzi also will interview members of national societies, such as the Society of Hispanic Professional Engineers and the National Society of Black Engineers.

"I'm trying to get the most diverse perspectives because I feel like that's key to really understanding how we can make sustainable change," he said. "I always wonder why we keep having the same cyclical problems with broadening participation in engineering, access, and belongingness decades after decades, even when there is a lot of money invested, a lot of research, many publications, and a lot of initiatives."

In his interviews, Murzi wants to hone in on three issues: individual perceptions, available support and opportunities, and structure and systems. He will use the results to create a national survey that will be disseminated to both Ph.D. students in engineering programs and early-career engineering faculty in various institutions and locations with a special focus on traditionally marginalized populations.

"I have seen two major trends on those in minoritized groups around DEI work," Murzi said. "Sometimes they either feel the need to be involved because they want to fight for their people and want to make it better for others, or they've had a terrible experience and don't want to engage. They feel it's 'not their job.' I really want to understand the full spectrum."

With the data collected from the survey, Murzi will design sustainable trainings for DEI leaders. And the data also will provide a big picture of how individual equity and inclusion work across universities overlaps with his own, creating opportunities for mutually beneficial training collaborations.

To ensure sustainability for his instruction model — and to distinguish it from just another DEI training — Murzi wants to embed developed trainings into formal structures in the College of Engineering, such as the curriculum for Graduate Student Success in Multicultural Environments, a required course for nearly all engineering graduate students offered by ENGE.

"We have a lot of requirements for Ph.D. students: They need to be good at research, they need to be good at many different things," he said. "But usually we don't pay much attention to them being ready to teach diverse students or to deal with difficult problems they will face as advisors. And so, I think making it a requirement for obtaining a Ph.D. will help with sustainability."

Murzi wants to communicate his research in an easily digestible way that anyone can understand. He feels his down-to-earth approach has helped him succeed in his current initiatives. Over the course of the five-year grant, he will build a website to host all his tools and trainings and will continue developing online resources, shared documents, infographics, and lessons learned papers.

He also anticipates using a storytelling framework to connect people to real situations in a meaningful way. DEI work is inherently challenging, Murzi said, because it's "emotionally intense." Whether in one-on-one conversations or DEI trainings, individuals emotionally connect with others who have been affected by injustice.

"It takes a toll on you," said Murzi. "And from a leadership perspective, people want to see change happening really fast. If you're doing this work meaningfully, it will take a lot of time to actually see the change, because you need to start by the rules. But in the long term, you can have an impact – it's just not easy to see right away, but driving meaningful change makes it worthy."

Article written by Niki Hazuda and originally published on VtX on June 13, 2022.

READ

Read more about Homero's grant at bit.ly/URL

Celebrating the 2022 Watford Award Winners

Our Engineering Education graduate students play a key role in research, teaching, and supporting the department. And thanks to a generous, anonymous endowment in 2021, we're able to annually recognize two students with the Dr. Bevlee A. Watford Outstanding Doctoral Student and Outstanding Dissertation Awards.

This year's recipients are Kai Jun (KJ) Chew and Janice Hall, for the Outstanding Doctoral Student and Dissertation Awards respectively.

As our Outstanding Doctoral student, Chew served as a Graduate Research Assistant and Graduate Teaching Assistant; vice president of the student chapter of ASEE; secretary and treasurer of the National ASEE Student Division; senator in the Graduate & Professional Student Senate; and the graduate student representative to the University Graduate Curriculum Committee.

"I am excited to start my new journey as an Assistant Professor at Embry-Riddle Aeronautical University," he said.

"I look forward to applying lessons learned from my Ph.D. to be an instructor who cares for his students' learning and well being, and a researcher who is passionate about translating research to inform practice in engineering education."

Hall's dissertation is: "Disaggregating the Monolith: A Case Study on Varied Engineering Career Orientations and Strategies of Black Women in Tech" and her advisor, Walter Lee shared about her work:

"In addition to focusing on an understudied topic, she also leveraged research methodologies that are not commonly used in the field of engineering education, so much so that she had to rely on self-education to develop expertise in this area," Lee said.

"Using existing data and social media artifacts in a qualitative study while also going the extra mile to ensure each participant is comfortable with their data being used this way is quite original and an exemplar example of innovative and ethical research."

Currently, Hall is pursuing a fellowship project at Florida International University, which extends her dissertation work on engineering career mobility into understanding the workforce development needs for alternative career pathways in engineering. She's also co-leading a summer undergraduate research experience to study how engineers from minority serving institutions (MSIs) plan to transition into the engineering workforce.

"To have others recognize and celebrate my work in such a way was a perfect ending to my graduate school journey," Hall said.

"It gave me perspective on my research's impact if put into practice. I am eager to continue exploring the space of engineering careers and helping to broaden participation in engineering through workforce development support that aligns with various career pathways."

Article written by Niki Hazuda and originally published on the Engineering Education website.

For the last 25 years, **the Frith First-Year Makerspace** (or Frith Lab, as some remember it) has served as a creative engineering space for our general engineering students. Whether practicing with the Tormach CNC mill or cutting wood on the Glowforge, our Hokie engineers safely learn to fail while enjoying the support and mentorship of sophomore, junior and senior Hokies who serve as undergraduate lab assistants. Check out some of this year's projects, or stop by Frith (lower level of Randolph Hall) when you visit Blacksburg!

HANDS-ON ENGINEERING

RESEARCH GRANTS

National Science Foundation

- **Supplemental funding: Institutional Transformation: Cultivating an Ethical STEM Culture through an Integrated Undergraduate General Education**
  $111,921 | PI: Dr. Diana Bairaktarova

- **Supplemental Funding: Research: Examining the impact of mechanical objects in students learning of thermodynamics-related engineering problems**
  $67,184 | PI: Dr. Diana Bairaktarova

- **SCC-CIVIC-PG Track A: Youth-centered civic technology & citizen science for improving community heat resilience infrastructure**
  $50,000 | Co-PI: Dr. Jake Grohs

- **Collaborative Research: RFE: An exploration of how faculty mentoring influences doctoral student psychological safety and the impact on work-related outcomes**
  $197,016 | PI: Dr. Mark Huerta

- **EAGER: Natural Language Processing for Teaching and Research in Engineering Education**
  $299,647 | PI: Dr. Andrew Katz

- **Collaborative Research: a research hub for understanding inter- and intra- institutional partnerships that systematically support low-income engineering students**
  $2,399,501 | PI: Dr. David Knight

- **Broadening Participation in Engineering (BPE): Inclusive Mentoring Hubs (IM Hubs) Grant for the formation of an inclusive mentoring hub called Raíces (or roots in Spanish) Institute for Transformative Advocacy (RITA)**
  $799,994 | Co-PI: Dr. Homero Murzi

- **CAREER: Sustainable Racial Equity: Creating a New Generation of Engineering Education DEI Leaders**
  $663,883 | PI: Dr. Homero Murzi

- **Collaborative: Research Initiation: Assessing Global Engagement Interventions to Advance Global Engineering Competence for Engineering Formation**
  $23,973 | PI: Dr. Homero Murzi

- **Collaborative Research: Intelligently Connecting the Professional and Educational Communities to Prepare the Future Construction Engineering Workforce**
  $2,163,084 | Co-PI: Dr. Homero Murzi

- **NRT: Disaster Resilience and Risk Management (DRRM) - Creating quantitative decision making frameworks for multi-dimensional and multi-scale analysis of hazard impact**
  $175,948 | PI: Dr. Marie Paretti

- **Advancing Student-Centered Teaching for Engineering Disciplinary Knowledge Building**
  $299,959 | PI: Dr. Nicole Pitterson

- **Collaboration in Engineering Student and Practitioner Teams: A Study of Beliefs about Effective Behaviors**
  $265,127 | PI: Dr. Nicole Pitterson

- **The Computer Science as a Career (CSAC) Scholars Program**
  $408,884 | Co-PI: Dr. Sarah Rodriguez

- **Center for Equity in Engineering: Organizational Transformation for Graduate Education**
  $1,199,981 | PI: Dr. Julie Ross

NSF Graduate Research Fellowships
Stephen Moyer & Andrea Schuman

External Grants

- **Student-Lead Early Academic Career Undergraduate Research in Sustainable Materials and Processes**
  $29,625 | PI: Dr. David Gray
  VentureWell

- **Motivating Successful Advising: Creating Productive Doctoral Advising Relationships in Engineering**
  $15,919 | PI: Dr. Holly Matusovich
  Arizona State University

- **Artificial Intelligence for All: A Framework for a College Certificate**
  $119,592 | PI: Dr. Sarah Rodriguez
  The District Board of Trustees of Miami Dade College, Florida & NSF International

- **Developing a Quantification System for Robot Moral Agency**
  $13,099 | PI: Dr. Qin Zhu
  George Mason University &
  The US Air Force Office of Scientific Research

- **Growing a Community of Compassionate Higher Education Teachers in STEM**
  $234,799 | PIs: Dr. Qin Zhu, et al.
  John Templeton Foundation

- **Identifying & Comparing how people in different cultures & sectors perceive and prioritize AI ethical issues differently**
  $24,926.25 | PIs: Drs. Qin Zhu & Rockwell Clancy
  4-VA Collaborative Research

Virginia Tech Internal Grants

- **Towards a Global ethics of artificial intelligence: Exploring and assessing intercultural ethical perspectives on AI**
  $10,000 | PI: Dr. Rockwell Clancy
  Engineering Faculty Organization-Opportunity Grant, Virginia Tech Institute for Critical Technology and Applied Science

- **Big Contribution Grant**
  $5000 | PI: Dr. David Gray
  Students' Engineering Council at Virginia Tech

- **High Impact Project: ACC-ALN Design Thinking ImpACCt**
  $8,325 | PI: Dr. David Gray
  Center for Excellence in Teaching and Learning

- **Center for Coastal Studies: Using natural language processing and social network analysis to investigate tweets about impacts of Covid 19 and climate change**
  $15,000 | PI: Dr. Andrew Katz
  Center for Coastal Studies

- **+Policy Fellowship: Exploring AI Ethics Policy Concerns and Career Pathways of the AI Professionals with Policy Training Experience**
  $10,500 | PIs: Drs. Dayoung Kim & Qin Zhu
  Policy Destination Area (PDA) of the Institute for Society, Culture, and Environment (ISCE) at Virginia Tech

- **An investigation of factors related to engineering major selection and persistence after impacts of the COVID-19 pandemic**
  $10,000 | PI: Dr. Susan Sajadi
  Engineering Faculty Organization-Opportunity Grant, Virginia Tech Institute for Critical Technology and Applied Science

- **Exploring the Eco-ethical Identity for Responsible AI Research among Faculty and Students**
  $20,000 | PI: Qin Zhu
  Institute for Critical Technology and Applied Science Diversity & Inclusion Seed Investment

Welcomes & Transitions

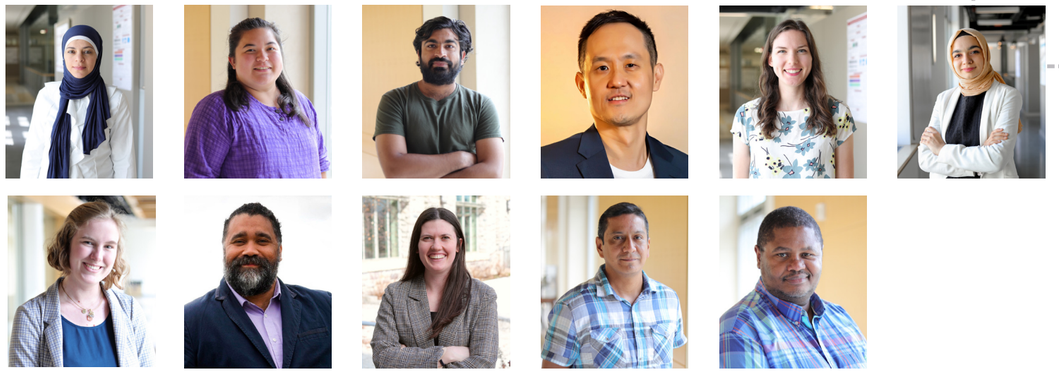
Thanks to support from Dean Julie Ross and the College of Engineering, we were able to add seven new faculty to our team, increasing our capacity for research, mentorship for our Ph.D. students and support for the next generation of Hokie engineers.

(left to right) Drs. Susan Sajadi, Cassie Wallwey, Qin Zhu, Dayoung Kim, Michelle Soledad, Sarah Rodriguez and Mark Huerta.

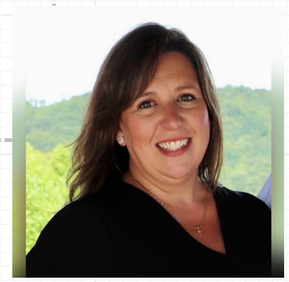
MEET

Meet our seven new amazing faculty in our "Changing the Face of Engineering Education story on **page 26.**

Fall 2022 Graduate Students



(left to right, top to bottom): Eman Amer, Michelle Choi Ausman, Tahla Bin Asad, Brian Chan, Marin Fisher, Beyza Nur Guler, Larkin Martini, James Newcomer, Olivia Ryan, Vladimir Sanchez Padilla and Joseph Sturgess



April Mullins
Career & Academic Advisor

April joined ENGE in July. She holds a masters in Counseling and Human Development, with a concentration in Student Affairs Administration, from Radford University. Prior to joining our department, she was Coordinator of Admissions and Records at Wytheville Community College, and has 20 years of experience in a range of academic advising roles at that institution.

Devin Erb
Career & Academic Advisor

Devin recently completed a masters in Postsecondary Education: Student Affairs at the University of Northern Iowa, joined ENGE in June. Devin has a rich profile of intern and GA roles she has held at this institution and also at Iowa State, where she did her bachelors – including roles in Financial Aid and a DEI office.

Tremayne Waller
Affiliate Faculty

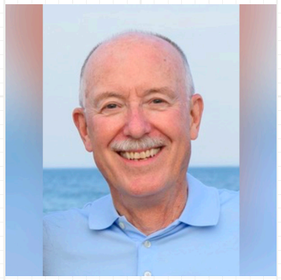
Tremayne "Trey" Waller received his Ph.D. from Virginia Tech in 2009. His area of research was examining the adjustment of engineering students in a summer bridge program. Trey is currently responsible for recruitment and retention for the College of Engineering graduate programs at Virginia Tech. He develops, leads and implements a strategic plan for graduate students.

Sreyoshi Bhaduri
Advisory Board Member

Sreyoshi Bhaduri is a research scientist at Amazon, where she uses AI augmented mixed methods research to make meaning of data from and on humans at work. She also serves as a senator for SWE and as advisor to the Sisters in STEM (SiS) team.

Brian Novoselich
Advisory Board Member

Brian Novoselich is an active-duty Army Colonel and Associate Professor at the United States Military Academy at West Point. He currently serves as the USMA G5, Director of Strategic Plans and Assessment. Among other duties, he's responsible for developing, implementing, and assessing the Academy's strategic plan and the Leader Development System. His professional military experience includes various Armor and Cavalry command and staff positions from platoon to brigade levels and includes operational and combat deployments to Bosnia, Kosovo, Iraq and Afghanistan.



Will Hill
Advisory Board Member

Will Hill is principal and owner of M.A.Warren, investing in start-up companies and advising larger companies on strategic planning and innovation. He is recently retired as a Director of General Tools & Instruments while currently on the board of the Connecticut Rivers Council BSA. Will has a bachelor's in mechanical engineering from Virginia Tech Mechanical Engineering and an MBA from Loyola University Maryland.

Why just read about Drs. Sreyoshi Bhaduri & Brian Novoselich when you can listen to them on our new podcast, **Careers for Engineers**? Listen now on Spotify!

Thank you to our advisory board members for their years of dedication & service to ENGE!

Dr. Brian Self

Dr. Noel Shultz

Chuck Clifton

David Heard

Sharon Scott

Executive & Operations

Dr. Jennifer Case
Department Head

Dr. David Gray
Asst. Department Head, Undergraduate Programs

Dr. Walter Lee
Asst. Department Head, Graduate Programs

Dr. Diana Bairaktarova
Asst. Department Head, Research & Engagement

Dr. Ben Chambers
Director of Frith First-Year Makerspace

James Newcomer
Advising Coordinator

Monte Hager
Business Manager

Margo Currie
Fiscal Coordinator

Tamara Knott
Academic Programs Manager

John Tilton
IT Systems & Support Manager

Lucinda Shewchuk
Grant Support Specialist

Mariah Henderson
International Programs Coordinator

Niki Hazuda
Director of Communications & External Relations

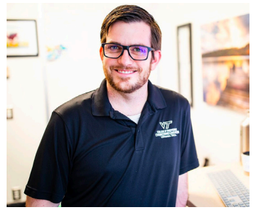
Tiffany Cunningham
HR & Operations Coordinator

Nick Bedard
Lab Manager

Tenured & Tenure-Track Faculty

Dr. Diana Bairaktarova
Associate Professor

Dr. Jennifer Case
Professor



Dr. Jacob Grohs
Associate Professor

Dr. Mark Huerta
Assistant Professor

Dr. Andrew Katz
Assistant Professor

Dr. Dayoung Kim
Assistant Professor

Dr. David Knight
Associate Professor

Dr. Walter Lee
Associate Professor

Dr. Vinod Lohani
Professor

Dr. Jeremi London
Associate Professor

Dr. Holly Matusovich
Professor

Dr. Lisa McNair
Professor

Dr. Homero Murzi Escobar
Assistant Professor

Dr. Marie Paretti
Professor

Dr. Nicole Pitterson
Assistant Professor

Dr. Sarah Rodriguez
Associate Professor

Dr. Susan Sajadi
Assistant Professor

Dr. Bevlee Watford
Professor

Dr. Qin Zhu
Associate Professor

Instructors, Professors of Practice, Collegiate & Research Faculty

Dr. Jennifer Benning
Instructor

Dr. Ben Chambers
Collegeiate Assistant Professor

Dr. Rockwell Clancy
Research Scientist

Dr. Tameka Clarke Douglas
Collegiate Assistant Professor

Dr. David Gray
Collegiate Assistant Professor

Matthew James, P.E.
Associate Professor of Practice

Dr. Jenny Lo
Senior Instructor

Dr. Juan David Ortega Alvarez
Collegiate Assistant Professor

Dr. Michelle Soledad
Collegiate Assistant Professor

Catherine A. Twyman
Instructor

Dr. Natalie Van Tyne, P.E.
Associate Professor of Practice

Dr. Cassondra Wallwey
Collegiate Assistant Professor

Undergraduate Academic & Career Advisors

James Newcomer
General Engineering Advising Coordinator

Matt Cheatham

Jennifer Chin

Jessica Elmore

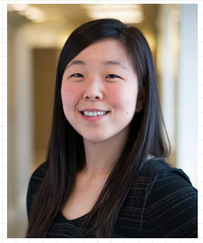
Devin Erb

Maia Greene-Havas

Alexis Miller

April Mullins

Daniel Newcomb



Alice Noble

Advisory Board

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Career Coach & Leader Advisor | *Hiller Avenue Partners LLC*

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Collegiate Assistant Professor, Electrical and Computer Engineering | *Virginia Tech*

Dr. Sreyoshi Bhaduri
Research Scientist | *Amazon*

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Diretor, Department of Engineering Fundamentals | *University of Tennessee, Knoxville*

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Associate Professor, Director of Strategic Plans and Assessment (G5) | *United States Military Academy at West Point*

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Teaching Assistant Professor, Electrical & Computer Engineering | *UNC Charlotte*

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Professor & Head of Civil, Environmental, Geomatic & Environmental Engineering *University College London*

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Anne Waldmiller
Business Control Manager | *Wells Fargo*

Ken Walker
Partner & Portfolio Chairman, *Falfurrias Capital Partners*

Affiliate Faculty

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Dr. Catherine Amelink | Associate Vice Provost, Office of the Executive Vice Provost, Virginia Tech

Dr. Liesl M. Baum Walker | Instructional Designer

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Dr. Aditya Johri | Professor, Information Science & Technology, George Mason University

Dr. Chelsea Lyles | Associate Director of Broader Impacts, Center for Educational Networks and Impacts

Dr. Tom Martin | Professor & Bradley Faculty Fellow of Education, Virginia Tech

Dr. Ken Reid | Associate Dean and Director of Engineering, University of Indianapolis

Dr. Donna Riley | Dean, School of Engineering, University of New Mexico

Dr. Julia Ross | Paul and Dorothea Torgersen Dean of Engineering, Virginia Tech

Dr. Tripp Shealy III | Associate Professor, Civil & Environmental Engineering, Virginia Tech

Dr. Denise Simmons | Associate Dean for Workforce Development, University of Florida

Dr. Lee Vinsel | Associate Professor, Science, Technology, and Society, Virginia Tech

Dr. Tremayne O. Waller | Director of Graduate Student Programs, CEED, Virginia Tech

Dr. Chris Williams | L.S. Randolph Professor, Mechanical Engineering, Virginia Tech

Dr. Matthew Wisnioski | Associate Professor, Science & Technology in Society, Virginia Tech

Emeritus Faculty

Dr. Jeffrey Connor
In Memoriam

Dr. Richard Goff

Michael Gregg

Dr. O. Hayden Griffin

Thomas Walker

2022 Continuing Graduate Students

Alaa Abdalla
Abdulrahman Alsharif
Eman Amer
Isil Anakok
Michelle Ausman
Ramón Benitez
Talha Bin Asad
Julia Brisbane
Jeremy Brown
Yi Cao
Brian Chan
Tahsin Chowdhury
Marin Fisher
Yasir Gamieldien
Carol Geary
Hannah Glisson
Benjamin Goldschneider
Tina Griesinger
Beyza Nur Guler
Nicole Jefferson
Taylor Johnson
Malini Josiam
Jazmin Jurkiewicz
Qualla Ketchum
TJ Koonce
Siddharth Sunil Kumar
Bram Lewis
Taylor Lightner
Karen Martinez-Soto
Larkin Martini
Adam S. Masters
Maya Menon
Stephen Moyer
James Newcomer
Matthew Norris
Tawni Paradise
Crystal Pee
Amy Richardson
Amanda Ross
Olivia Ryan
Vladimir Sanchez Padilla
Lisa Schibelius
Malle Schilling
Andrea Schuman
Umair Shakir
Jeremy Smith
Sam Snyder
Joseph Sturgess
Hamid Taimoory
Maggie Webb
Sophia Vicente

Doctoral Alumni

Dr. Ashish Agrawal | Assistant Professor, Anurag University

Dr. Mayra Sharlenne Artiles Fonseca | Assistant Professor of Engineering, Ira A. Fulton Schools of Engineering, Arizona State University

Dr. Debarati Basu | Assistant Professor, Engineering Fundamentals, Embry-Riddle Aeronautical University

Dr. Cheryl Beauchamp | Department Chair; Assistant Professor, Engineering & Computer Science; Director, Institute for Cybersecurity, Regent University

Dr. Sreyoshi Bhaduri | Research Scientist II, Global Talent Management, Amazon

Dr. Karis Boyd-Sinkler | Director of Diversity, Equity and Inclusion in Engineering, Pratt School of Engineering, Duke University

Dr. Matthew Boynton | Engineering Coordinator, Bledsoe Telephone Cooperative

Dr. Daniel Brogan | Associate Professor of Engineering, Virginia Western Community College

Dr. Cory Brozina | Associate Director, Rayen School of Engineering; Assistant Professor & Director, First Year Program; Program Coordinator, Industrial & Systems Engineering Program, Youngstown State University

Dr. Philip Brown | Assistant Professor, School of Engineering, Rutgers University

Dr. Wm. Michael Butler | Martin Marietta

Dr. Cheryl Carrico | Owner, Cheryl Carrico Consulting, LLC

Dr. Kai Jun "KJ" Chew | Assistant Professor, Embry-Riddle Aeronautical University

Dr. Bushra Chowdhury | Lead Data Scientist, D2M

Dr. Kelly Cross | Assistant Professor, Biomedical Engineering, Georgia Tech

Dr. Juan Cruz Bohorquez | Assistant Professor, Experiential Engineering Education, Rowan University

Dr. Stephanie Cutler | Director of Assessment and Instructional Support and Associate Research Professor, Penn State University

Dr. Kirsten Davis | Assistant Professor of Engineering Education, School of Engineering Education, Purdue University

Dr. Parhum Delgoshaei | Assistant Teaching Professor of Systems Engineering, Penn State – Great Valley

Dr. Jessica Deters | Assistant Professor of Mechanical & Materials Engineering, University of Nebraska – Lincoln

Dr. Michael Ekoniak | Assistant Professor, First-Year Engineering and Electrical & Computer Engineering, Youngstown State University

Dr. Alejandro "Andrew" Espera, Jr. | Postdoctoral Research Associate, University of Tennessee, Knoxville

Dr. Joshua Garcia Sheridan | Engineering Education Researcher

Dr. Chris Gewirtz | Research Operations, Edward Jones

Dr. Andrew Gillen | Assistant Teaching Professor, First Year Engineering, Northeastern University

Dr. Andrea Goncher | Instructional Assistant Professor, Department of Engineering Education, University of Florida

Dr. Janice Hall | NSF eFellow Postdoc, Florida International University

Dr. Cynthia Hampton | Postdoctoral Research Fellow, Center for the Enhancement of Engineering Diversity, Virginia Tech

Dr. Amy Hermundstad Nave | Faculty Developer, Trefny Innovative Instruction Center, Colorado School of Mines

Dr. Cory Hixson | Assistant Professor of Engineering, Colorado Christian University

Dr. Teirra Holloman | Postdoctoral Research Associate, Virginia Tech

Dr. Deirdre Hunter | Lecturer, Oshman Engineering Design Kitchen, George R. Brown School of Engineering, Rice University

Dr. Yousef Jalali | Postdoctoral Researcher, École polytechnique fédérale de Lausanne, Switzerland

A few of our ENGE Ph.D. students at the May 2022 end of the year celebration. *Photo by Niki Hazuda.*

Dr. Rachel Louis Kajfez | Associate Professor, Engineering Education, The Ohio State University

Dr. Timothy Kinoshita | Analyst, U.S. Government Accountability Office

Dr. Stephanie Kusano | Assistant Director of Assessment at the Center for Research on Learning and Teaching, University of Michigan

Dr. Walter Lee | Associate Professor, Engineering Education, Virginia Tech

Dr. Racheida Lewis | Assistant Professor, School of Electrical and Computer Engineering, University of Georgia

Dr. Ben Lutz | Assistant Professor, Mechanical Engineering, California Polytechnic State University

Dr. Darren Maczka | Lecturer & Research Assistant Professor, Engineering Fundamentals, University of Tennessee – Knoxville

Dr. Cassandra McCall | Assistant Professor, Engineering Education, Utah State University

Dr. Erin (Crede) McClinch | Operations Manager, The Outpost

Dr. Rachel McCord | Director, Senior Lecturer and Research Assistant Professor, Engineering Fundamentals, University of Tennessee – Knoxville

Dr. Jean Mohammadi-Aragh | Assistant Professor, Electrical and Computer Engineering, Mississippi State University

Dr. Jacob Moore | Associate Professor, and Assistant Director of Academic Affairs, Penn State Mont Alto

Dr. John Morelock | Associate Director, Engineering Education Transformations Institute, University of Georgia

Dr. Jennifer Mullin | Assistant Professor of Teaching Biological and Agricultural Engineering, University of California – Davis

Dr. Homero Murzi Escobar | Assistant Professor, Engineering Education, Virginia Tech

Col. Brian Novoselich, Ph.D., P.E. | Associate Professor, Dept Civil & Mech Engineering; Director of Strategic Plans and Assessment, United States Military Academy at West Point

Dr. Andrea Ogilvie | Assistant Dean for Student Success, Assistant Professor of Instruction, Texas A&M University

Dr. Desen Ozkan | Postdoctoral Researcher, Center for Engineering Education and Outreach & Institute for Research on Learning and Instruction, Tufts University

Dr. Tawni Paradise | Adjunct Assistant Professor, Department of Industrial Engineering, University of San Diego

Dr. James Pembridge | Professor and Chair, Engineering Fundamentals, Embry-Riddle Aeronautical University

Dr. Logan Perry | Assistant Professor, Engineering Education, University of Nebraska-Lincoln

Dr. David Reeping | Assistant Professor, Department of Engineering Education, University of Cincinnati

Dr. Kevin Sevilla | Lecturer and Assistant Professor of Engineering, Charles Sturt University

Dr. Courtney Smith-Orr | Teaching Assistant Professor, Electrical and Computer Engineering, University of North Carolina – Charlotte

Dr. Michelle Soledad | Collegiate Assistant Professor, Engineering Education, Virginia Tech

Dr. Elizabeth Spingola | Data Engineer Senior Consultant, IBM

Dr. Kenneth Stanton | Data Scientist, CafeMedia and Co-Owner, CFO of Team B. Solutions LLC

Dr. Heidi Steinhauer | Professor and Associate Dean, Engineering Fundamentals, Embry-Riddle Aeronautical University

Dr. Ashley Taylor | Director of Education, Institute for Global Health, Rice University

Dr. Hon Jie Teo | Chair, Department of Career and Technology Teacher Education, New York City College of Technology (City Tech)

Dr. Lauren Thomas Quigley | Research Scientist, IBM

Dr. Katherine Winters | Research Civil Engineer, US Army Corps of Engineers

Dr. Natalie Van Tyne | Associate Professor of Practice, Engineering Education, Virginia Tech

Dr. Christopher Venters | Assistant Professor, Department of Engineering, East Carolina University

Dr. Lilianny Virguez | Instructional Assistant Professor, Department of Engineering Education, University of Florida

Dr. Adetoun Yeaman | Engineering Education Postdoctoral Fellow, Department of Engineering, Wake Forest University

Dr. Glenda Young | Engineering Education Researcher

Article photographs taken by Peter Means, Niki Hazuda and the ENGE Communications Intern Team. Staff head shots taken by Peter Means, Linda Hazelwood, Michelle Soledad and Niki Hazuda. Advisory Board and affiliate faculty head shots provided by respective department websites or individually submitted.

Questions, comments or concerns about this report? Please email nhazuda@vt.edu.

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Join us on social to be an active part of the ENGE community, celebrate our accomplishments, and get the latest news and events.

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ENGINEERING EDUCATION
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