



NC STATE UNIVERSITY

ENGINEERING EDUCATION

2025-2026 Annual Report



WELCOME

Vision and Values



The mission of the Engineering Education Program at NC State University is to transform engineering education through evidence-based translational research, inclusive pedagogy, and innovative, student-centered practices. We support students, faculty, and the broader community by delivering research-informed instruction, fostering interdisciplinary collaboration, providing professional development, and preparing the next generation of educators, practitioners and scholars. Our work advances education for all students, deepens learning, and informs best practices across the engineering education ecosystem.

We envision the Engineering Education Program at NC State University as a global leader in engineering education innovation—advancing knowledge, empowering change-makers, and transforming learning environments. Grounded in inclusive excellence and driven by research, we define how engineering leaders are educated to pioneer solutions for the evolving needs of a diverse and interconnected world.

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A Word from Our Co-Directors of Engineering Education

The year 2026 has presented numerous opportunities and challenges for the world of Engineering Education, and NC State has met them enthusiastically. Our graduating students are being highly sought after for positions, which is a source of pride for us. Although budget challenges at the system level meant that it wasn't the time to propose our PhD in Engineering Education, we didn't let that stop us! We now have multiple PhD students who are pursuing PhDs through their engineering specialties and have engineering education faculty as their primary or co-advisor. We have proven the worth of our MS and our certificate with students now enrolling in the MS as a part of their PhD program in their disciplines as well. The graduate certificate makes prospective faculty members stand out as they seek academic positions. So, all-in-all, we are finding many ways to spread the word on high-quality engineering education!

A continual challenge for us is finding funding for the research and development projects that we want to pursue. At this time, we don't have funding to support our MS students. Providing support would allow us to expand our enrollment significantly, so we are always on the hunt for sources of funding.

Additionally, we are working with INES University in Rwanda to put on summer training programs for K-12 teachers in engineering, with the help of INES engineering students. The local conditions in Rwanda mean that teachers need funding for transportation and lodging, so we are working to find funds for this project as well. During a March visit to Rwanda, I visited with a coffee washing station run by a local NGO to help small coffee farmers bring their beans to market. The station needs some engineering updates that our NC State engineering students are more than capable of doing, but the need for funding is also slowing this project! Do you see a theme here? I would say that the next year will be very much focused on opening up opportunities to find funding sources of all types. If you are reading this and are interested in helping with any of our work, please do be in touch! We will be happy to put your support to work!

With great hope for the coming year,
Dr. Laura Bottomley
Director of Engineering, Engineering Education



This past year has been one of significant growth and accomplishment for Engineering Education at NC State University. We continued to expand both our Master of Science in Engineering Education and Graduate Certificate programs, attracting a growing number of students committed to advancing engineering teaching, learning, and research.

One of our major achievements was the successful planning and hosting of the annual Engineering Education Symposium from the College of Engineering. The event brought together faculty, students, and practitioners from across the university to explore emerging research, innovative teaching practices, and opportunities for collaboration. The symposium generated tremendous enthusiasm for the future of engineering education at NC State, and we look forward to continuing this important tradition each spring. We are grateful to everyone who participated, presented, and supported this event.

Throughout the year, we introduced new courses, strengthened our curriculum, and celebrated successful graduates from both the master's degree and certificate programs. These accomplishments reflect the dedication of our faculty and the growing demand for engineering education expertise.

Our program further strengthened its international engagement through new collaborations, partnerships, and educational initiatives. We hosted and met with faculty and visitors from countries including Brazil and Taiwan who are interested in learning more about NC State's approach to engineering education. These collaborations continue to strengthen our global presence and create new opportunities for research and educational partnerships.

A particularly meaningful milestone was the establishment of the Richard Felder Award, recognizing Dr. Richard Felder's pioneering contributions to engineering education at NC State and his lasting impact on the field nationally and internationally.

We are deeply appreciative of the continued support provided by the deans and leadership of both the College of Engineering and the College of Education. We also extend special thanks to Dr. Linda Krute and the Engineering Online team for their outstanding efforts in marketing, student support, and program growth.

Additionally, we have actively supported international initiatives, including the Rwanda educational experience, which provides students with meaningful opportunities to apply engineering education principles in a global context and serve communities abroad.

Looking ahead, we anticipate continued growth, expanded international partnerships, and an ongoing commitment to serving the citizens of North Carolina while advancing engineering education worldwide. We are proud of this year's accomplishments and excited about the opportunities that lie ahead.

Sincerely, Dr. Aaron Clark
Director of Education, Engineering Education



Engineering Education Research Symposium

In January 2026 the NC State community gathered for the inaugural Engineering Education Research Symposium to learn from and collaborate with others from across the campus to advance engineering education research. The support of Dean Jim Pfaendtner of the College of Engineering and Dean Paola Sztajn of the College of Education were essential in the planning and implementation of this event. Appreciation should also be extended to the event coordination teams of the College of Engineering Dean's Office and the James B. Hunt Jr. Library for their assistance in coordinating the symposium.



Over 120 faculty, staff and students from the university participated in panel discussions, interactive workshops, lightning talks and poster presentations.

NC State was also honored to welcome two plenary speakers to share their perspectives on the past, present and future of engineering education. Dr. Adam Carberry and Dr. Idalis Villanueva Alarcón were also presented with The Richard Felder Award for Transformative Work in Engineering Education.

The instructor panel on Artificial Intelligence was led by Dr. Edgar Lobaton, the Committee Chair of Applied AI in Engineering and Computer Science at NC State. The panel discussed how AI is shifting classroom dynamics, tools that educators can use, and necessary teaching and grading adjustments to promote academic integrity. Professors discussed challenges with identifying AI generated student submissions, promotion of fundamental knowledge in Computer Science courses, and how tools can be used in collaborative design assignments.

Interactive workshops highlighted the impact of intentional instructional design with topics including but not limited to micro-moments, problem-based learning experiences, and Universal Design for Learning. Lightning talks and poster presentations included a myriad of topics from across the engineering and education disciplines.



JOIN US AT NEXT YEAR'S SYMPOSIUM



SAVE THE DATE
JANURAY 8, 2027
Call for proposals
begins Fall 2026

Celebrating Transformative Work in Engineering Education

The Richard Felder Award for Transformative Work in Engineering Education recognizes individuals in the field of engineering education who have fundamentally shaped the way we understand and practice the work. Engineering Education at NC State awarded this honor in its inaugural year to two deserving national leaders. Both had the opportunity to address the attendees of the research symposium as keynote speakers and share their expertise and perspective on educating engineers for a changing world.

Contributions from Dr. Felder

The origins of engineering education at the university can be traced to the work of Dr. Felder in the early 1980s. His work as a chemical engineer and researcher laid the foundation for his interest in how students learn in the classroom, turning his focus to instructional techniques and their impacts on learning outcomes.



Recognizing the 2026 Awardees

Dr. Adam Carberry

Dr. Adam R. Carberry is Professor and Chair in the Department of Engineering Education at The Ohio State University (OSU). Dr. Carberry has conducted important research on developing new classroom innovations and assessment techniques and identifying new ways to empirically understand engineering student and educator experiences.



Dr. Idalis Villanueva Alarcón

Dr. Idalis Villanueva Alarcón is Professor and Chair of the Engineering Education Department in the University of Florida at Gainesville. Dr. Villanueva Alarcón has developed groundbreaking approaches to engineering education research and innovated methods to study and apply evidenced-based teaching.



➔ Read about the 2027 call for nominations on the following page

Innovating in the Classroom

Artificial Intelligence in Engineering Education course

The class will address many issues and questions around the role of artificial intelligence in engineering education. Students will be challenged to assess how AI tools can be used to enhance learning in the classroom, including as learning companions and support for undergraduate engineering students. We will address the question of what engineering students need to learn about AI before they graduate and what competencies industry expects them to have. We will also learn ways to use large language models to enhance concerns like course design, preparation and grading. We will talk about what responsibilities instructors have with regard to ethical AI use as well. Students will participate in discussions, debates, and explorations with a variety of types of AI applications, with the goal of preparing them to teach in a world of engineering education that is changing by the day!

Engineering One Planet Sustainability Modules

Dr. Cameron Denson had an opportunity to apply sustainability focused learning modules to his fall 2025 Teaching Pedagogy for Service-Based Engineering Design course. These modules were designed as part of the American Society for Engineering Education's Engineering One Planet grant, awarded to Denson and his co-PIs, Dr. Julio Terán and Dr. Veronica Catete, in 2024.

Process Oriented Guided Inquiry Learning

Dr. Wendy Krause is applying Process Oriented Guided Language Learning (POGIL) within her graduate level courses. She reflects that it is extraordinarily effective with graduate level learners, likely reflecting their levels of self motivation in relation to undergraduates. It also helps students transition from traditional direct instruction to self and peer learning.

Student-Centered Learning

Nancy Moore teaches a technical elective, Steam and Gas Turbines, each fall and has redesigned the course to emphasize real-world applications by requiring students to be curious about new research and connect concepts in the course to real design. Students are required to read and summarize peer-reviewed journal articles in a jigsaw activity which increases their curiosity in gas turbine cycle design. They must also develop their own research question about steam turbine cycles and use the opportunity to tour a power plant to find answers to their questions. In groups, they then choose one research topic to present to the class.



2027 Nominations for the Richard Felder Award for Transformative Work in Engineering Education

The administration of this award is organized by Engineering Education at NC State. The Felder Award prioritizes original research, transformational practice, and the broad dissemination of findings that have influenced engineering programs on a national or international scale. Candidates for this award exhibit a dedication to furthering the field of engineering education at the national level, have evidence of their efforts via academic recognitions (publications, presentations, awards, etc.), and demonstrate a minimum of ten years of service to the field.

Winners of the award will be announced in January of each year. Interested parties can visit <https://eed.engr.ncsu.edu/symposium> to learn more.

STUDENT REFLECTIONS

Doctoral Applications of Effective Communication of Engineering Topics



Christopher Oates
Ph.D. Biological and Agricultural Engineering
En-route Master of Science in Engineering Education

It was a Teaching Assistantship position within his first semester of graduate school that introduced Christopher Oates, a doctoral student in Biological and Agricultural Engineering, to classroom instruction and ignited his interest in education. Now pursuing an en-route Master of Science in Engineering Education as part of his graduate studies, Christopher experienced his impact in the classroom from the very start, earning a departmental TA award and positive course evaluation mentions in his first semester in front of a class. He chose to further explore teaching via courses offered by Engineering Education that introduced him to the fundamentals of pedagogy, course design and assessment. When Christopher was presented with funding from the National Science Foundation via the Graduate Research Fellowship Program, he decided that completing a Master of Science degree in Engineering Education en-route to his PhD would be a worthwhile investment of time and effort.

He reflects on how the education courses provided him with the ability to bring intentional design to the way that he shares his work. One of the underrated parts of the coursework, Chris explains, is its application to communicating outside of classroom settings. He uses principles of pedagogy when designing conference presentations, educating high school students in departmental summer camps, and even speaking with policy makers at the North Carolina General Assembly. Talking about engineering and educating people can happen in a variety of environments and understanding teaching principles allow effective communication across audiences. Experience in engineering education has allowed me to “better tell a story, tell the background and why it is important, and then what we’re doing to fix that”, Chris states. He looks forward to opportunities to continue adapting and learning alongside students as part of his role as a doctoral student and researcher.

RECENT GRADUATE PERSPECTIVES



Hannah Hiscott saw their pathway to professorship early on when she was in grade school with a passion for learning and interest in physics and earth materials. After completing undergraduate degrees in civil engineering and physics and a masters in geotechnical engineering, they chose to pursue their PhD in geotechnical engineering at NC State University. Hannah notes that one of the driving factors of their academic career has been the value of mentorship and recognizing the merit of the knowledge of others. She chose to complete the Graduate Certificate in Engineering Education alongside their doctoral studies in order to strengthen their ability to foster classroom ecosystems that work for all students.

Hannah reflects that intentional teaching practices allow for a variety of student learners to thrive in engineering classrooms. “Rather than just drowning students in problems, we can use psychological and sociological theory to create an accessible learning environment” Hannah shares. They know that some students have a capacity for greatness in engineering fields but may be dissuaded by learning environments that weren’t

traditionally set up for them. Wider access to quality engineering instruction is not just important for student success and fulfillment but also for real-world infrastructure design.

“You come up with the best engineering solutions for communities when you have every community member represented within an engineering team”

Hannah explains. Creating instruction for students who may fall outside of the traditional qualities associated with engineers has the opportunity to positively impact the way problems can be solved.

Hannah has accepted a tenure-track faculty position at Randolph-Macon College upon their successful completion of their dissertation this summer. One of the responsibilities of the position include the development of new course groups for engineering and physics education, specifically for the k-12 environment. Hannah anticipates the challenges of understanding the challenges of the new age of students and is excited to apply their background in order to build more empathetic student environments.

Mary Dykstra’s career trajectory has allowed her to utilize her bachelor and master degrees in Mechanical Engineering across multiple environments, beginning in industry, teaching at the high school level and most recently, in her current role as an instructor at Coastal Carolina Community College. When her role as a military spouse brought her to North Carolina, Mary was introduced to the distance education programs offered by NC State. Completion of the Graduate Certificate in Engineering Education program provided her with the opportunity to complement her technical knowledge with online classes focused on teaching at the postsecondary level.

Mary taught in Jacksonville, North Carolina while completing evening distance education courses in the Engineering Education program. She reflects that her exposure to those pedagogy courses has shifted her teaching practices towards the active searching for and implementation of research-backed strategies in her classroom. It was powerful for Mary to see existing practices of hers supported by pedagogical research as well as gaining ideas to tweak her methods. This access to a deepened base of knowledge also allowed her to effectively adapt to the challenges of teaching course subjects that she had less experience implementing. She was able to successfully conduct developmental math courses for the first time with a less familiar audience of adult learners with confidence.

As she looks towards her future goals, Mary finds the early engineering courses at the undergraduate level to be the most rewarding for her to teach. The impact she is able to have on developing students is important to her and “I really like helping them believe that engineering can be their field if they want it to be and helping them believe that they can do it” she reflects.

Mary speaks about what makes a good instructor for students within this foundational time in their development. When a student is upset, it’s important to notice that they cannot absorb academic information until the emotional situation they are dealing with is resolved, she explains. Recognizing and addressing varying student needs comes from a specific overlap of skills that make someone a good instructor and mentor within that zone. Mary hopes that her impact on students of all backgrounds can be beneficial as she prepares students for shifting professional futures likely to be driven by emerging technologies.



INTERNATIONAL CONNECTIONS

Marissa Boretti on her Engineering Education Practicum Experience

How did you determine the project for your practicum?

When determining the subject of my practicum, I was between two programs at NC State; SEE Camp through ASCEND or the Rwanda Study Abroad Program. My undergraduate career was strongly shaped by my involvement as a prior participant in (a form of) each of these programs. I ultimately chose to pursue the Rwanda Study Abroad Program as the focus for my practicum because I felt my duty in Rwanda was not complete. The ASB made a huge impact on my life and the path of my career. I felt that returning to the same schools that we had attended previously to continue to build NC State's relationship with our partners was the best opportunity and would allow me to help scaffold the program for future cohorts.

Dr. Catete, my supervisor for the program, and I spent an afternoon discussing the needs of the program. From there, we determined which of those needs I had the authority and bandwidth to complete, such as activity development, reflection facilitation, and professional development with the in-country teachers.

What skills and proficiencies have you developed thus far in your practicum experience?

So far in the practicum experience, I have grown in my adaptability, leadership, and communication skills. I have also expanded my knowledge set on arduino microcontrollers and generative AI, specifically their uses as educational tools.

How have you applied the things you learned in EED courses to your practicum work?

I took a service-based learning course which I believe was incredibly helpful for this practicum. The course helped me evaluate which activities would be the most beneficial for the students and have the most relevant real-world applications. It also focused a lot on the importance of reflection, both in the classroom with students and after the lesson with the educators. We utilized both of these reflections while teaching to maximize the effect of the experience for everyone involved.



What was something that surprised you about the practicum experience? Have there been any specific memorable moments?

One thing that has surprised me from the practicum experience is the amount that I have learned from conversations with the other students on the study abroad program and their experiences in the local schools. Coming into the practicum, one of my personal objectives was to observe our NC State students and the way they teach to determine which teaching methods and lesson plans were the most effective. With this, there were some limitations because all of our activities were happening simultaneously, so by rotating I would potentially be missing a great class. Hearing from the other NC State students about some of the classes I missed taught me just as much as the ones I observed. The most memorable moment was hearing about a specific local secondary student who was participating in the water collection activity. During this class period, it started raining outside, and this student went outside into the rain to test her device in a real-world setting without being prompted to do so. This was exciting to see because it shows how valuable the activities we are doing are for the students and that the connection between the engineering activities and their practical uses is being understood.

What have you learned in this experience that you can apply to your future career?

As an engineer, it is crucial to be able to explain complex concepts despite the technical knowledge gap often found between engineers and non-engineers, which is similar to the language barrier we encountered in Rwanda. During this experience, I have learned a lot about the way in which information is processed by different people in many different ways. It is important to be able to adjust accordingly. Throughout this experience, I have developed new communication strategies and confidence in adapting my instruction to meet the needs of diverse learners. Engineering is largely a team-focused field, therefore I aim to use these skills greatly in my future career.

Please share about your career goals and what impact you think the engineering education masters and practicum experience will have on future opportunities for you.

Following my graduation from the engineering education program, I hope to pursue a career in the medical technology industry as a technical educator or design engineer. I often say that the bridge between invention and innovation is education; you must be able to teach people how to use your product or else you are limiting its potential, and you must let the users educate you on their needs. I believe the engineering education master's program and practicum experience have, and will continue to, equip me with the pedagogical knowledge and practical teaching skills necessary to make a meaningful impact in the medical technology field.

In addition to the educational aspect, this program is the perfect combination of engineering and education. Due to this, I was able to continue growing my knowledge within biomedical engineering and have taken additional courses which I would not have been able to during my undergraduate. I have even earned my ISO 13485 (medical device standards) internal auditor certification through one specific class that I would not have been able to take prior to this program.

Dr. Leah Granger exhibited interest in education throughout her undergraduate studies in chemical engineering and mathematics. As a senior graduate student, the opportunity to teach undergraduate courses shifted her focus from high school teaching to post secondary education. When she was presented with the opportunity to pursue a postdoctoral position with faculty in NC State's Engineering Education program, the people were the deciding factor. Working alongside people with a passion for education was uplifting for Dr. Granger.



“It felt really good to be around people who spoke the same language and had the same passion to further our students’ experiences within our programs”

she reflects. Dr. Granger’s formalized pedagogy training and research in engineering education set her apart from peers when applying for faculty positions following her postdoctoral experience.

Dr. Granger appreciates the more formalized, intentional instructional mindset that she developed from engineering education. Intentionality is important, particularly when gathering data to assess the effectiveness of teaching, she states. One thing that surprised her was that the student perception of what works can be different from what their performance and learning measurements indicate. There is always the possibility that less popular classroom implementations can still yield positive performance metrics. Data backed decision making is one of the benefits of intentional assessment and facilitates the application of research theories within the classroom. People are not as predictable as molecules and knowing how to test and measure learning outcomes is valuable, Dr. Granger explains.

She reflects that the interdisciplinary nature of engineering education at NC State is a valuable way to discover new ideas and perspectives outside of her home department. Observing how others run their classes and how different departments operate has been very valuable to Dr. Granger. This exposure also allowed her to learn about other options and professional pathways within the field of higher education, which she views as a major advantage in her career development. Her future research interests include a multi-year longitudinal study on student cohorts as they complete their chemical engineering programs. She views engineering education as a valuable group to assist with developing protocols and assessments for the logistical challenges presented with a long-term study.

Congratulations to Dr. Granger on her recent Richard M. Felder Teaching Excellence Award from the Department of Chemistry and Biomolecular Engineering



Introducing Engineering Education’s Advisory Board

Engineering Education at NC State is excited to share the creation of our initial advisory board. Our program is in its first few years of operations and feedback from community members at the university and state level provides us essential perspectives on our programming. Our hope is to improve the education of engineers not just at NC State but across North Carolina. The community college professionals on our board will play an essential role in our efforts to strengthen engineering pathways for learners of all backgrounds.



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Publications

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Conference Papers

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Conference Presentations

Baldwin, T., Townsend, L., Arenas, A., & Hughes, M. (2025). *Evaluating the Impact of a STEM-focused Advanced Manufacturing Program on Rural Middle School Students’ STEM Content Knowledge Development*. Presented at 2025 ASEE Annual Conference.

Baldwin, T., Townsend, L., Hughes, M. and Arenas, A. (2025). *Engaging rural middle school students in authentic STEM learning experiences through innovative course design*. Presented at Bridging the Gap 2025 Annual Conference, Research Triangle Park, NC.

Marshall, L. (2025). *Fueling the Pipeline: Driving Workforce Growth Through Innovation*. Presented at ANS-NEI Nuclear Energy Exposition & Conference.

Marshall, L., Brady, L., & Goodman, M. (2026). “Nuclear” Career & Professional Development in Academia. Presented at the 2026 Waste Management Symposium.

McCoy, D., Bowser, A., Baldwin, T., Townsend, L., Hughes, M. and Arenas, A. (2025). *Exploring AI in advanced manufacturing through hands-on problem-based learning: a summer residential program for rural middle school students*. Presented at the Bridging the Gap 2025 Annual Conference, Research Triangle Park, NC.

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Our People



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Master of Engineering Management Program

The Engineering Education program and administrators are appreciative of the support from the leadership of the College of Education and College of Engineering in the continued success of this collaboration. Dean Jim Pfaendtner and Dean Paola Sztajn have played important roles in the development of this initiative and the championing of interdisciplinary collaboration across the university. We also extend our appreciation to Dr. Linda Krute, the Director of Engineering Online at NC State for her guidance and support in the operational aspects of our programming. We are excited for the academic year ahead and to continue building and strengthening our relationships within the university and beyond.

Would you like to donate to student experiences in Engineering Education? Scan below!



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Questions, comments or concerns about this report? Email mistaffo@ncsu.edu.

