I specialize in teaching social science and ethics for undergraduates majoring in science and engineering. I have had the privilege to work with different populations of students, including elite undergraduates at Cambridge and students from a variety of underrepresented groups in STEM at the New Jersey Institute of Technology. At UVA, I primarily teach required STS courses for undergraduate engineers. (UVA offers no undergraduate or graduate STS degree.) I have designed three new courses, all funded by selective UVA fellowships (i.e., from the Center for Teaching Excellence, the Institute for Practical Ethics, the Pavilion Seminar program). I also teach data ethics for the School of Data Science. These experiences have taught me three key educational strategies: make classes relevant to students’ professional and personal interests, be welcoming and inclusive, and strive to make learning engaging and fun. My work as an educator extends beyond the classroom to include mentoring students from underrepresented groups and supervising undergraduate researchers. Furthermore, I strongly value studying learning and sharing pedagogical strategies.

All my courses introduce students to sociotechnical analysis, in which we use theories and methods from the social sciences to investigate how social and technical factors interact to create systems that include people, knowledge, and things. My courses provide significant practice and instruction in writing, as a tool for both thinking and communicating. My writing pedagogy has benefitted from a fellowship at a week-long Faculty Workshop on the Teaching of Writing, which improved my ability to design inclusive assignments, incorporate effective drafting and revision into coursework, and provide feedback that helps students learn. Assignments for my courses include interviewing engineers, proposing recommendations to improve diversity and inclusion in engineering labs, designing a code of ethics for data science, and writing a year-long thesis. Students consistently give my courses high evaluations. They are particularly grateful for the professional skills they learn in my classes, such as how to define and study sociotechnical problems, assess evidence, compose compelling arguments, and make ethical decisions.

For the required thesis, undergraduate engineers integrate their technical research with their analysis of its social implications. I have supervised 227 students in at least one course of the STS 4500-4600 sequence, which involves significant individual mentoring as students learn to design and conduct their own sociotechnical research. Moreover, five of the ten sections I have taught were off- cycle, meaning that they served students whose academic journey was either ahead of schedule or – more typically – was disrupted by health issues, financial hardship, or transferring from community college. These students tend to need more intensive support, which I enjoy and which is why I regularly volunteer to teach the off-cycle section. Perhaps as a result of my efforts to meet students where they are and work with them to achieve excellent research, students have invited me twice to attend the annual 2nd-Years’ Dinner, and the engineering students’ secret society, P.R.I., selected me for their 2018 Commitment to Students Award.

Teaching must serve students’ academic, professional, and personal needs. Therefore, I listen closely and encourage feedback so that I can discover how my students learn best. Through this approach, I often encounter students who initially view my classes as inconvenient requirements for graduation. They are busy learning the right answers to technical problems, while my classes ask them to rethink how they define “problems” as well as “answers.” My responsibility – and my favorite part of teaching – is to address their misconceptions and help them replace their initial resistance with an appreciation for thinking about engineering from social perspectives. One successful method is through discussion of case studies. I design my syllabi to be flexible so that I can include students’ interests and current events, such as how facial recognition algorithms discriminate against people of color, the benefits and pitfalls of open COVID19 data, and where responsibility lies in the Volkswagen emissions scandal. These examples help students discover how and why people matter for technical design.

Another way I try to win over students to new ways of thinking is through active learning and self-designed research. The three courses I created at UVA, for example, invite students to

investigate the interactions between society, research, and technology. My “Laboratory Life” course teaches students how to conduct social research methods to better understand the realities of doing engineering research. Based on data they collect from lab visits and interviews, they design an ideal research space and community. They present their designs to the director of the SEAS Link Lab, a group created to encourage interdisciplinary collaboration among faculty. Students appreciate the hands-on assignments, and they gain a new understanding of engineering practice. Another course, “What is Knowledge?”, similarly empowers students to study knowledge production as a social activity. From guest speakers, we learn how different disciplines create knowledge. Students then design studies to better understand knowledge production in their own discipline. Likewise, “Ethical Analytics” provides students with an integrated introduction to data science and data ethics, co- taught by a mathematician and me. As they learn feature engineering alongside the dangers of discriminatory algorithms, students apply their ethical and mathematical analytical skills to interpret a dataset of their choice. Their projects have included predicting which cities will remove their Confederate monuments and evaluating universities’ risk of having a COVID outbreak.

To empower students to conduct such impressive work outside of their majors and their comfort zones, my courses must foster an inclusive environment. Many students fear being wrong; to lessen this fear, I ask open-ended questions. For example, in STS 4500, “STS and Engineering Practice,” I ask students to list the attributes of a good engineer, a good technology, a good regulation, etc. They respond with ideas inspired by our readings as well as their experiences. Many students are surprised when they hear the variety of answers, and they practice their argumentation skills by disagreeing with each other. I moderate discussions carefully to welcome diverse points of view. Sometimes I ask students to write briefly about a question before we discuss it. This strategy encourages quieter students and non-native English speakers to talk in class, because they feel prepared. Beyond modeling an inclusive community, I include diversity, equity, and inclusion in all my courses, such as through case studies of discriminatory or empowering technologies and strategies to enact engineers’ professional responsibility to support colleagues through policies and allyship. My goal is to ensure that my students are well prepared to conduct future engineering work that is fair and equitable for all stakeholders and particularly for marginalized social groups.

My students’ fear of being wrong also appears in their discomfort with assignments that do not have a correct answer. At first, students asked for detailed explanations of my expectations of good work, so I wrote rubrics. But students were still unsatisfied. They considered judgments of good writing to be “subjective.” I learned to explain that there are indeed standards, and we work together as a class to identify them. We do this by analyzing examples of arguments, including students’ own writing, to identify admirable and problematic characteristics, which students then learn to emulate or avoid. Peer review provides a powerful form of this learning. Students practice giving and receiving constructive comments, skills which I have learned to make explicit beforehand. In the process, they help each other think through ideas and exchange writing strategies. I invite them to offer comments about my rubrics, such as by asking what “professional writing” means, and I gladly revise the rubrics based on their ideas. This process is a valuable exchange of expectations. As a result, students write better papers, are more motivated to improve their writing, and are more satisfied with their grades. For example, in 2016 my STS colleagues ranked two of my 60 students’ papers as among the ten best papers written by the fourth-year class (630 students). After taking my courses, students are grateful for the opportunity to discuss and evaluate multiple arguments and worldviews, and they feel empowered to create good solutions for socially relevant problems.

My classes include students from all engineering majors, thereby offering students a rare opportunity to practice interdisciplinary teamwork. I place students in various groups to work on in- class activities, such as responding to a reading, video, cartoon, or discussion question, and out-of- class projects. For example, in STS 4600, “The Engineer, Ethics, and Professional Responsibility,” small groups of students plan an interactive class about an ethical dilemma of their choice, such as

whether and how genetic engineering should be regulated or who is responsible for the lead in Flint’s water supply. To help students think about and achieve effective collaboration, I ask them to rate each other’s contributions. Students take these peer evaluations seriously because they respect their classmates and want to work well with them. Communicating evidence-based sociotechnical arguments and ethical interpretations is difficult and important work, and so is collaboration. I have learned that students are willing to work harder on these challenges if their teammates are collaborators rather than competitors or strangers.

My support for students extends beyond teaching. I have mentored eight undergraduate researchers, four through the USOAR program for students who receive federal work-study funding. All eight belong to underrepresented groups, including immigrants, first-generation students, and racial, ethnic, and/or gender minorities. These researchers keep me accountable with their insightful questions and strong work ethic, and their analysis of my data has been invaluable. Three of them have contributed enough thought and effort to become my co-authors (Wylie et al. 2019, Wylie and Kim [accepted]). I also mentored three students from underrepresented groups (two first-years and one graduate student) in a one-year commitment, and then I continued to meet with them regularly until they graduated. Overall, I am committed to connecting students with resources and opportunities, writing powerful recommendation letters, offering advice, and just listening.

Furthermore, my studies of students’ research experiences have implications for improving diversity and inclusion, identity formation, and professional skill development in engineering education. I regularly share these insights with my engineering colleagues by emailing my publications to our faculty list, sharing results at SEAS annual retreats, and presenting at the American Society for Engineering Education (ASEE) annual conference, which publishes full papers in its peer-reviewed, open-access proceedings. Specifically, I was the lead author of three papers about my research (Wylie & Gorman 2018, Wylie et al. 2019 [co-authored by three undergraduates], Wylie et al. 2020), lead author of a paper about assessing students’ sociotechnical analysis skills (Wylie et al. 2017), lead author of a paper about using comics to encourage students’ engagement and critical thinking (Wylie & Neeley 2016), and co-author of two papers about how STS contributes to engineering education (Odumosu et al. 2018, Neeley et al. 2019). I also shared my department’s innovations in teaching STS to engineering students by organizing a presentation with colleagues for the largest STS conference, the Society for the Social Studies of Science (4S).

I have sought opportunities to work with graduate students, even without a graduate STS program. I teach a required ethics course for students pursuing an MS in data science, for which I create my own syllabus. I co-supervised a capstone team of MS students in data science (Beane et al. 2018). I serve on a student’s doctoral committee in environmental science. I have supported the graduate student-run Science Policy Initiative, such as by speaking at two of their public events. I have served on the Graduate Studies Committee to guide policy on graduate education in engineering. When the Graduate Student Engineering Council wanted to assess student satisfaction and identify future priorities, I volunteered to serve as their faculty advisor. I guided their survey design, helped them apply for IRB approval, and continue to oversee their data analysis. I regularly serve as a mentor at 4S conferences, where I offer STS graduate students feedback on job applications and help connect them with other scholars.

By fostering relevant, inclusive, and fun exploration of the unfamiliar field of STS, I seek to empower students to conduct thoughtful, responsible, and socially-beneficial engineering work. In the future, I plan to create courses in STS and ethics for engineering graduate students and for undergraduates outside of engineering. My research on student learning and professional development is expanding (see my Research Statement), and I was recently selected as a fellow for UVA’s year-long Scholarship of Teaching and Learning (SOTL) Institute. I look forward to continuing to educate engineers to embrace the social contexts of their work and to apply their expertise to build a more just and sustainable sociotechnical world for us all.