Identity as key to diversity and inclusion

Computer science faces a crisis of diversity. The majority of computing professionals, whether researchers or practitioners, are white or Asian males. We represent a small fraction of our users, yet our systems are used the world over. This state of affairs damages the profession and the society we serve. In engineering practice, valuable perspectives are missed during development, and the resulting systems do not meet the needs of users as well as they might. And in the research process, the biases of the researchers can cause important questions to be sidelined, where a more diverse research team could better observe and investigate underserved groups or unobserved phenomena.

The computing community can resolve this crisis only when its members do their part. How will I support diversity and inclusion within computing? I am cognizant that I am a member of the dominant culture in computer science in every conceivable way: abled, white, male, cisgender, middle class, son of IBMers, US citizen, native English speaker. As a member of this culture, I have the responsibility and the opportunity to act hospitably, to invite outsiders in and actively make them feel welcome, and to encourage other members of the dominant culture to do likewise. I think a critical challenge in changing the computing culture is helping outsiders develop an identity as a member of the computing culture.

Although I am part of the dominant culture in computing, through my international travels I have learned something of the experience of a stranger in a strange land. From Morocco to Montmartre, from Beijing to Bangalore, I have been in circumstances where I was utterly dependent on my hosts. I acknowledge that this is the briefest glimpse of the experience of an outsider looking in on a majority culture. But these experiences permit me to empathize. My travel experience has taught me the value of both initial invitations and ongoing inclusion from the dominant culture towards the outsider. Without an invitation an outsider will not enter. Without ongoing efforts to include outsiders, they will not develop an identity as a member of the community and will have little motivation to remain.

Helping students develop a computing identity

I apply these principles as an instructor in the classroom and a research mentor in the laboratory. I apply these principles indiscriminately; there are reasons both visible (e.g. race, gender) and invisible (e.g. socioeconomic status, sexual orientation) for why someone might not identify within the computing culture, and everyone deserves invitation and inclusion.

Inviting outsiders into computing

In Spring 2019 I was the instructor for Introduction to Programming in Python (CS1064). This course is for non-majors, and my 70 students came from a mix of STEM and non-STEM fields. I began the course by inviting these outsiders to engage with computing. And throughout the course I emphasized ongoing inclusion so that they felt welcome. I lectured about variables and functions, but I did so through examples that were relevant to my students. To demonstrate lists, we walked through not a calculator but how a historian might extract text from primary source documents. When illustrating a more complex program, I demonstrated not a video game but how a social scientist might automatically process audio recordings. In these and other ways, I reminded the students that they were both invited and welcomed into the world of computing.

Encouraging ongoing inclusion

In Fall 2019 I was the instructor for Algorithms and Data Structures (CS3114). Most of the students in this course are computing majors and have already accepted an invitation into the computing community. But the students in this course view it as one of the major hurdles to graduation. The course has a high drop/withdraw rate and leads some students to change majors, leaving the community entirely. Sometimes these changes may be for the best, but other times a student may blame their struggles not on the difficulty of the course but rather on themselves, believing that they do not “belong” in computing. I therefore give my students regular reminders that they are members of the computing community. Here are three examples of how I help my students develop an identity as computer scientists. First, I learn their names, a simple way to remind students of their individuality and emphasize that they, personally, belong. Second, I remind my students that computing is hard – it takes practice to become proficient, and their struggles are not abnormal. Third, I use computing examples that will resonate
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with students from many backgrounds with many interests. These examples help my students see themselves as the computer scientist in the story.

I have mentored ten students in research projects, from high schoolers up to early PhD students. A common challenge I have seen in my mentees is developing a research identity. Some of my mentees adopt a passive posture as a technician rather than an active posture as a researcher. When I observe this behavior, I meet with the mentee to diagnose the underlying cause. Is it a misunderstanding of their role on the project? Is it a feeling of ignorance or inadequacy (“imposter syndrome”)? By identifying the cause, I can fully invite them into the world of research and monitor their growth over time.

Crossing cultural boundaries

Although the computer science community is not diverse in comparison to the world, new practitioners and graduate students may still find it surprisingly culturally diverse compared to their home cultures. I certainly did! As an engineer at IBM and as a graduate student at Virginia Tech, I have worked with engineers and researchers hailing from countries including China, Bangladesh, Iran, India, Germany, France, the UK, Canada, and Mexico. I am still learning about the implications of cultural differences in communication style, leadership, and power dynamics, and the more I learn the more effective I become as a practitioner and an educator.

I have spent five years preparing undergraduates for these cultural differences. By doing so, I invite them into engineering practice and give them a clear sense of what it will be like. Since 2015, I have spoken in Virginia Tech’s Rising Sophomore Abroad Program about my International Engineering experiences at IBM. These first-year students (majority white US citizens) are surprised to learn the realities of professional engineering work. By explaining this to them early in their undergraduate career, they have plenty of time to prepare themselves for industry. I have twice led short-term study abroad trips (Australia in 2018, Spain/Morocco in 2019) to facilitate as students experience cultural differences in a hands-on way.

I also give new graduate students advice in navigating the US academic culture. As a service to the VT CS department, I have been the president of my department’s graduate student council and spent several years organizing a reading group. These activities have given me a sense of the experiences of new graduate students. One issue I often see is new students who misunderstand the advisor-advisee relationship in US institutions, to the detriment of their mental health and progress towards their degree. These students have joined the computing community, but without ongoing inclusion efforts from the majority culture they have trouble interpreting their experiences. I strive to include them: each semester I sit down with several of new graduate students to discuss the cultural expectations around topics like communication, productivity, and negotiation.

Future plans for diversity and inclusion

As a faculty member, I will continue to encourage diversity. Whether as an instructor in the classroom or as a leader in a research laboratory, I have and will continue to invite students and future researchers into computing, as well as to regularly encourage them to develop an identity within the community.

Most of my efforts so far have been oriented towards encouraging ongoing inclusion, rather than extending the initial invitation. Once I am a professor, I will join in targeted efforts to invite and include students from underrepresented populations. I believe bringing in female students is the most pressing problem; university-wide enrollments are half female and half male, yet computer science enrollments are predominantly male. As the president of my department’s graduate student council, I have heard some of the effects of this trend on a personal level. Female students have shared with us about the ways they feel they do not belong and their desire for more female role models. By collaborating with organizations like the AWC and participating in undergraduate events (during the academic year) and K-12 activities (during the summer), I hope to contribute to making computer science a more gender-diverse discipline. I also view undergraduate research opportunities as a promising way to help female students identify as leaders within the field, having seen my two female undergraduate mentees “lean in” to the computing community as a result of our research together.

Making computing a diverse, inclusive discipline will not happen overnight. We must begin new efforts and sustain existing ones in order to make progress. I look forward to doing my part.