**Educate engineering and science faculty in leadership skills**

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Educate engineering and science faculty in leadership skills
To lead effective technical teams, professors need to learn how people operate, say Charles E. Leiserson and Chuck McVinney.

Education does not stop. Professors know they must update and develop their technical skills throughout their careers. But as they progress, few take the time – or are offered the opportunity – to become educated on how to be an effective leader. As a consequence, technical academic teams waste time dealing with unproductive interpersonal issues, lack of motivation and unnecessary conflict. Researchers fail to communicate effectively with peers and funding agencies. When things don’t run smoothly, the costs in terms of research dollars, productivity, and retention of research talent can render an otherwise excellent research agenda mediocre.

Leaders inspire others to achieve shared goals. Professors show leadership when they head research teams or manage teaching staff. They lead intellectually, charting directions for advances in engineering and science that benefit society. As professors gain in seniority, the importance of leadership skills grows: for better or worse, people defer to their presumably wiser and more powerful senior colleagues. They may lead collaborations or run departments. But even well meaning senior professors can wreak havoc by obliviously throwing their power around and by failing to take into account emotions in others or themselves.

Take this true (sanitized) scenario. A major university laboratory wanted to replace their retiring director. There was no doubt as to the successor — the energetic and popular assistant director was a shoe-in. At the first meeting of the search committee, made up of a few senior lab members, the chair reviewed the procedures, which included soliciting opinions from the rest of the faculty. A consensus emerged that this “bureaucratic process” would be a waste of time. “We know what the answer will be,” they said. “Everybody likes him. Let’s just appoint him now.”

Do you see the committee’s blind spot? They were threatening to marginalize the rest of the lab, particularly the junior faculty, by failing to get their buy-in for the appointment. Instead of saving time, the fallout of this high-handed behavior could cost everyone needless effort and degrade the collegiality of the lab. A professor who feels disenfranchised is less motivated to help solve lab issues, leaving more work for others. If they depart for greener pastures, the rest of
the faculty must hire a replacement, cover the lost professor’s classes and take responsibility for abandoned graduate students. When emotions are involved, what seems like expediency can turn out to be the opposite.

In this case, one member of the search committee did show true leadership, even though she had no official leadership position. She explained the risks of the rash action and persuaded a majority of the committee that the ‘bureaucratic process’ was a necessary step. The faculty interviews identified major issues for the next lab director to face, and when the popular assistant director was promoted as expected, he had a mandate for instituting important changes.

Over the past dozen years, we have taught leadership workshops for hundreds of engineering and science faculty. Virtually none of the professors had ever taken a class in leadership skills or knew of any other program similar to ours. Those who did have leadership education learned it in industry. Indeed, corporate America spends $14 billion each year on educating their employees in leadership and management [B14]. But while universities offer MBA programs to business people, when it comes to their own faculty, leadership seems to be a dirty word, synonymous with administration and manipulation.

Being a professor is a human-centered activity. We work with people. We teach students in classrooms, mentor our Ph.D. students, collaborate with peers, and even try to persuade the people in granting agencies to give us money. At most universities, junior faculty must learn leadership skills on the job by trial and error, to the detriment of their students and their careers. Senior faculty may not understand that a failure to provide a supportive and collegial culture harms the reputation of their department or laboratory, and they may be ill-equipped to engage effectively in large collaborative projects, such as ENCODE. We call on academia to invest in developing their professors’ human-centered leadership skills.

**Team troubles**

We met in 1999. One of us (Leiserson) had taken a two-year leave-of-absence from MIT during the Internet boom to serve as Director of System Architecture at the MIT start-up Akamai Technologies. Most of the firm’s original 100 engineering staff (Akamai now employs over 5000 people) were recruited directly from MIT and other top universities.

At the start, these brilliant academics were totally dysfunctional as a team. Every interpersonal issue you can imagine arose: alienation, anger, apathy, arrogance, belligerence, contempt, despair, disgust, disrespect, envy, exasperation, fear, hate, impatience, indifference, jealousy, outrage, resentment, self-righteousness, spite, suspicion, vindictiveness — the whole gamut. Despite their intellectual prowess, these erstwhile academic colleagues could find no way out of this emotional morass. Many worried they had made the wrong move leaving academia. Morale was low.
Fortunately, Akamai’s Vice President of Human Resources, Steve Heinrich, supplied the right medicine. He brought in the other of us (McVinney), an experienced management consultant, to run an intensive leadership workshop for the technical leaders. Topics included dealing with emotions in the workplace; working effectively with people who think differently from you; fostering creativity; resolving conflicts; giving effective feedback; learning to recognize when different situations call for different leadership strategies; and understanding how learning curves relate to motivation. The results were immediate. Harsh feelings dissipated. The engineering staff began to cooperate and technical successes started to pile up.

**Academic leaders**

Back at MIT, we wondered why these soft leadership skills weren’t taught to engineering and science professors. The same kinds of emotional issues arise in university labs as in corporate workplaces. Although professors pride themselves on their rationality, they have feelings, too.

So, the two of us teamed up to adapt materials normally used for corporate training to the technical academic context. We also developed university-specific content from scratch, including role-playing activities involving professors and granting agencies, professors and peers, and professors and students. We offered the workshop for the first time in 2002 to a computer-science lab (Leiserson’s) at MIT. The response was so positive that we expanded participation to include the Electrical Engineering and Computer Science department, and eventually, the School of Engineering and the School of Science. In 2007, offered our two-day workshop to professors outside of MIT [LM15].

Our workshop has now been taken by hundreds of professors across the United States and the world, including custom workshops at Berkeley, Carnegie Mellon, Harvard, MIT, Purdue and Singapore. Participants often express amazement at what a little leadership education can do, from avoiding spending hours on interpersonal issues to supplying tools for motivating students.

Our workshop focuses on how people can work together effectively. It promotes self-awareness of personal styles of leadership and offers participants new approaches to explore. Through interactive activities, self-assessment exercises and group discussions, attendees develop a repertoire of strategies for addressing common situations.

Participants learn that different situations call for different leadership styles. Since leadership styles are individual and situational, we are careful not to judge styles as good or bad, focusing instead on helping participants to see that there may be more options available than they realized.

Participants practice their skills with role-playing activities. For example, the module on conflict resolution concerns a dispute between two students on first authorship. Another participant plays
the role of the professor trying to resolve the dispute. Method-acting techniques encourage the two student players to empathize with their characters, making the activity as close to a model of a real-world situation as can be had in the classroom, emotions included.

**Different thinking**

The workshop helps participants to explore their own leadership styles through self-assessment surveys. For example, we employ the Herrmann Brain Dominance Instrument (HBDI) [HH15] to investigate mental diversity. Most people think of diversity in terms of the first three things that psychologists say people notice when meeting someone new: race, gender and age. But there is probably more diversity in how people think than in any physical aspect of their beings.

Ned Herrmann originally developed the HBDI in 1978 when he was leading management education at General Electric. Herrmann was inspired by Roger W. Sperry’s Nobel Prize-winning work on ‘split-brain’ patients [G15], which showed that different areas of the brain perform specific functions. In most people, the left hemisphere is associated with speech and symbol manipulation, whereas the right hemisphere processes images and responds to sensory experiences and nonverbal clues.

Herrmann augmented Sperry’s left- and right-brain metaphor to incorporate the role that emotions play in thinking. Our emotions sway our intellect, and our intellect tempers our emotions [G95]. The resulting ‘Whole Brain’ model (Figure 2) categorizes thinking styles in four quadrants. Left-brain thinking includes rational and safekeeping processes. Right-brain thinking includes feeling and creative processes. Of course, human thought is much messier but this approximation is helpful for understanding communication and conflicts among people.

For example, a professor can use such knowledge to ‘up the game’ of her research group. She realizes the advantages of matching a student’s role in a project to their thinking preferences rather than to her own. Suppose that a laboratory experiment requires detailed accounting and focused individual work. A student with strong safekeeping preferences will likely be happier and more productive in this role than a student whose strong feeling preferences incline them toward interpersonal relationships. When matched to their thinking preferences, students are more likely to be motivated, to work happily and efficiently, and to self-manage, leaving more time for the professor to focus on her other priorities.

Research teams are best formed from a mix of diverse thinkers. Most real-world tasks require contributions from all four quadrants. When too many people on a team exhibit the same preference patterns, they tend to compete for the same ‘desirable’ roles, and it can be hard to find someone to do the ‘undesirable’ chores. A diverse team gives everyone a chance to contribute in a complementary fashion. And research shows [DW06] that gender-balanced teams of diverse thinkers tend to outperform same-thinking teams.
Leadership education

Professors tend to be skeptical about many things, and leadership is no exception. Over the years, we have heard many academic colleagues in engineering and science, especially senior ones, express opinions as to why soft skills are pseudoscience and should not be taken seriously: people skills cannot be measured and understood the way a subatomic particle, a strand of DNA, or a computer algorithm can be; humans are unpredictable and emotional and cannot be understood systematically; people skills are unimportant in the academic world because everyone tends to act rationally. With this kind of vision among their senior leadership, no wonder few universities have historically bothered to teach leadership skills to their faculty.

But business schools know that leadership can be taught, and our experience shows that these same skills can help engineering and science faculty — in fact professors are thirsty for it. With leadership skills, professors gain more control over their environment, they are better able to influence their students and their peers and they put themselves in a position to advocate for educational and scientific values in society at large.

There are indications that things are changing. The science of team science [BGL10] is a rapidly growing cross-disciplinary field of study that aims to maximize the efficiency and effectiveness of team-based research in the sciences. The growing interest in entrepreneurship among technical academics has led to a greater understanding within universities of the importance of leadership skills. And ‘big science’ projects, such as CERN, the Human Genome Project and ENCODE, highlight the importance of leadership skills.

Next steps

We call on the academic world to invest in the development of leadership skills among engineering and science professors.

Individual professors should seek opportunities to enhance their leadership skills through education. And universities should provide more courses for professors to enhance their leadership skills. Not only will skillful leaders among their faculty engender a better academic environment, it will reduce frictions between faculty and administration. Government and professional societies should also promote leadership education among engineers and scientists.

Smooth-functioning and innovative research teams are essential for producing the high-quality research needed to address and solve the many challenging problems our society faces.
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Availability over the next few weeks:
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pretty available after July 6th

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Figure 2. Herrmann’s Whole Brain model provides a first-order engineering approximation of mental diversity.