

Sparking passion for change

Canadian engineering at work in developing countries

by Parker Mitchell

"An educational system isn't worth a great deal if it teaches young people how to make a living but doesn't teach them how to lead a life." Anonymous

Meet Shubha Balasubramanyam. A 22-year-old computer engineering student in the top fifth of her class at the University of Toronto, she graduates next year. Many of her classmates are preparing for a career with a hardware or software company.

But Shubha's passions lie elsewhere. Last summer she worked with a professor to research muscular processes in people with spinal cord injuries. Before that, she went to India on a placement with Engineers Without Borders, working with a local IT portal to help rural non-governmental organizations develop a presence on the Internet.



A different education: Engineers Without Borders volunteer Benji Plener with Joseph Chabamba, a 12 year old Congolese refugee in Zambia. Benji worked as a technical coordinator with a Care Canada project to construct a mill to grind maize.

Ask her what she wants to do when she graduates and a torrent of words is unleashed: "Ever since I was a kid I've been struck by the poverty around me. In India, I lost count of the times that I saw people drinking unclean water or living eight or nine to a room. I've always known that I want to devote my life to helping people who were born with so few opportunities." She's planning a senior research project creating educational software to help illiterate Tamil women learn to read their language.

To me, Shubha's story vividly illustrates a question at the heart of our engineering education. Universities are tasked with the challenge of forging students to become technically skilled problem solvers. They are succeeding admirably. But do we not also want our engineers to be socially committed citizens and leaders, at the forefront of tackling society's most pressing problems? Shouldn't our education system foster that civic responsibility and build those leaders?

Three billion people live on less than \$2 a day. More than one billion have no access to safe water. And 800 million are hungry. The engineers of today-and tomorrow-will be at the forefront of developing solutions. Engineers Without Borders, a non-governmental organization in Canada, gives engineering students and others the hands-on opportunity to work in poorer communities around the world.

We can only answer that question if we have a vision for the profession. It is that vision that determines the mandate of our engineering education.

So let me step back for a moment from the topic of engineering education and ask about the past and future of engineering.

I'll begin with a simple question: Can you name the father or foundation of engineering? The fact is engineering's roots frequently go unremarked. This is not true for other professions: modern medicine can be traced back 2000 years to the analytical rigour of Hippocrates. The bedrock of today's legal system was the Magna Carta, codified more than 800 years ago. And even Adam Smith's "dismal science"-a relative newcomer at 200 years old-has its place in the Nobel pantheon. What happened to engineering?

I'd suggest that we are not recognized because our profession is as old as humanity itself. Our history is a story of technology; since the dawn of time, humans have been using our ingenuity to create tools to harness nature for survival and comfort. Those first tools, whether a well, the wheel, or irrigation, drove humankind's development. And they came from the hands of the first engineers.

From this perspective, the history of engineering is quietly noble. It is the story of applying practical problem-solving skills to society's most pressing challenges.

As for engineering today, we are certainly solving practical problems. Every two years the speed of our computers doubles, our cars become safer and our factories more efficient. But there are other, more pressing challenges facing humanity. Do we have the passion and skills to address them?

Meeting the challenge

Unfortunately there are many such challenges: mitigating global warming and meeting the obligations of the Kyoto Accord, managing urban sprawl and regenerating our cities, improving healthcare and medical services. These are highly visible and critically important challenges for engineers.

Another challenge frequently goes unnoticed. I would argue that it is the most pressing issue facing humanity today: fulfilling the "millennium development goals".

Three years ago, the people of the world, through the United Nations, agreed to a series of goals regarding the state of world poverty. The objective was to halve the number of people living in absolute poverty, who go hungry and have no access to safe water. These goals are both exciting and disheartening. They are exciting because they represent a consensus regarding a course of action and will therefore focus resources where they will have the most impact.

But they are disheartening because of the dismal reality they represent. Three billion people live on less than \$2 per day. More than one billion have no access to safe water. And 800 million are hungry.

Engineering will be front and centre in finding solutions to these problems. It will be present in every hand pump built for those without water, in every irrigation project to help feed the hungry, and in every manufacturing company that will be the backbone of economic growth.

Taking the lead

Whether it relates to development, the environment or human health, technology can drive extraordinary change. Engineers have the opportunity to take the lead in finding solutions to the world's pressing problems—not because they are told to, but because they are passionate about improving the world we see around them. And not just for themselves, but for all citizens.

What does it take for engineers to lead this social change? At a minimum, they need the hard skills that are the backbone of the profession: a rigorous approach to problem solving that enables the engineering mind to approach new challenges and generate potential solutions, a firm grasp of facts relating to mathematics, and a knowledge of past successes and failures.

But technical expertise alone is not enough to solve these problems. Engineers will need skills that complement their technical competence, such as the "soft" skills. Social change requires that these skills be used to build consensus across broad groups of society.

Above all, engineers need the passion to step out of traditional career paths, to share a vision of a better world. That should be part of engineering education—indeed, all education. As the Irish poet W. B. Yeats wrote, "Education is not the filling of a pail but the lighting of a fire." Today, it seems we learn only the "how" of engineering. We never stop to think about the "why." And it is this moral compass that will make engineering graduates better citizens.

Development engineering

The field of development engineering offers lessons on the need to complement the purely technical skills of the profession. In development work, the social, political, cultural and economic context frequently trumps technical considerations. Take for example,

address water quality, sanitation and hygiene practices. The installation of a handpump won't do much if dirty hands on a pail handle contaminate the clean water. Likewise, a handpump won't function for very long without a village committee to maintain it and a local repair person to service it periodically.

In trying to meet this particular goal, engineering, the marketing of good hygiene, community building and microeconomics all play an interrelated role.

It is from this multifaceted nature of engineering in development that Engineers Without Borders suggests three necessary skills.

First: humility. Working with others, engineers tend to assume that they have "the answer." It is more likely that the local community, which has been coping with its harsh environment for decades, has "better answers"—though not the means to achieve them. Engineers are there to assist them.

Second: interdisciplinary thinking. Engineers must be able to complement technical knowledge with the social, cultural, economic and political realities of the world around them. Because they cannot be experts in everything, they must seek the input of others and incorporate it into their own thinking. Needless to say, this means that engineers must be good communicators.

Last, but certainly not least: complex problem solving. Many engineers get a sense

"It's the kind of thing they don't teach you in engineering school: once you've built new sewage and clean-water facilities in a tiny west African community like, say, Bafoussam in Cameroon, then you have to instruct all the residents [about hygiene]. It's not enough just to work out where the latrines should be so they don't contaminate the drinking water."

Maclean's article on Engineers Without Borders, February 2003.

the fourth millennium development goal: reducing infant mortality.

A major source of child illness is water-borne disease. Reducing morbidity requires a three-pronged approach to

of accomplishment when they find the "right" answer to a problem. But social problems have no easy answer: How do we decrease our reliance on fossil fuels? How can we contain urban sprawl? Engineers

should be at the forefront of helping to answer these pressing questions, and do so with input from others.

Passion for change

Without the “spark” to make change, all this training means nothing. Luckily for the world, there are more and more people like Shubha coming through the schools-young people who combine technical expertise with a passion to improve the world.

Engineers Without Borders has seen this growth with our own eyes. Three years ago,

When EWB meets ERC

Prospective P.Engs should note that participation with Engineers Without Borders may or may not count toward the experience requirements for licensure. “It all depends on what the work actually consisted of, regardless of the surroundings, circumstances or for whom you did the work and how it combines with other engineering work experience that one obtains here in Canada or elsewhere,” says Noreen Calderbank, P.Eng., manager of the engineering intern training program for PEO.

we were only an idea scribbled on the back of a napkin. Today, we have over 3500 mem-

bers across Canada who are committed to development.

They envision a world of opportunity, dignity and freedom, where people can meet their basic human needs and attain their full potential. What they see today is a world in which billions of people struggle to build their lives in the face of tremendous poverty.

These engineers in development are grateful for the opportunities afforded to them. And they seek to use their good fortune to help address inequalities.

Shubha is only one of over 60 young Canadians who have gone overseas with Engineers Without Borders in the past two and half years. Today she has returned from her placement in India working in poor communities. This summer, rather than take a traditional engineering path, she has opted to volunteer full time with the Engineers Without Borders head office staff as our Director of Overseas Sending. She is training and supporting the 22 young engineering students and recent graduates who recently departed for overseas with Engineers Without Borders-ensuring that they have the necessary skills to match their commitment to helping people around the world.

Tomorrow, through her work, there will be 22 more Shubhas out there representing the human face of engineering and helping people live better lives.

Because you never know which sparks will light into a fire. ✦

Parker Mitchell is co-CEO of Engineers Without Borders, a non-governmental organization that supports development in poorer communities. Its work is funded by donations. To learn more about the organization, visit www.ewb.ca.

