

At the heart of the 21st century engineering, lies students' creativity and innovation

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As I sit in Indira Gandhi International Airport after a week of visiting Indian Universities, discussing engineering and computer science, I find myself reflecting on how we ensure that the 21st century is memorable for our wise use of technology to assist society in solving our global problems. What are those problems that can be tackled with technology? I beg your indulgence to allow me to share my views. Three key areas that require our full attention are the environment, agriculture, and public health.

Our global society is currently engaged in discussing our precious environment and debating global warming.

Scientists and engineers gather data, and analyse that data to seek evidence to guide society and their representatives. It is a highly complex problem, and in 2019 we do not agree on the way forward. Scientists and engineers need to provide more clarity.

Agriculture was a key element in the rise of humankind and has remained so until this day and will remain so for the foreseeable future. However, we have evidence to support the proposal that our current practices will have a negative impact on our environment. We need to get smarter in our use and reuse of our precious organically rich soil, to save us from turning into lifeless dirt.

Our global society can be measured for its value through the health of our global citizens. We have made and are making great progress in this area, but great challenges remain. How wonderful it would be to be able to design any drug, as we currently design a complex electronic circuit.

To tackle the world's problems, we must unleash the creativity of young people including engineers and computer scientists.

I have met many dedicated students in India, all willing to engage with me in discussing their work, and from the sparkle in their eyes I see their joy in their studies. That sparkle and joy is seen in students engaged in their studies wherever in the world you find them being challenged to think, and not just repeat what they find.

At my university - the University of Essex in the UK - we have a global community of students and staff from over 150 countries. We strive to provide a transformational education for our students, so they can be rebels with a cause, dedicated to challenge the world with their ideas. Ideas formed from their unleashed creativity and imagination.

My small part, along with my colleagues in the School of Computer Science and Electronic Engineering, in this transformational education has been to create 'challenge degrees' through three challenge weeks, one in each of the three years of our bachelor's degrees. I also wanted

to give our students three experiences of being given a problem to solve in a fixed time frame of one week, with all other educational activities suspended. I was inspired by my grand nephew, 5 years old at the time. His mother, my niece, explained to me how he had declared to the world that he was an inventor. His enlightened teachers decided to reward him with inventor time if he completed his set work before the end of the day. His creations, using anything he could find, were the spark to my desire to transform his inventor time into challenge weeks.

In the summer of 2017, a volunteer group of my colleagues set to work and within less than two months they had drawn on their collective creativity and imagination to build the year 1 challenge week to be held in the 1st year students first week of their studies.

In teams students worked over that week, with gentle guidance, to develop their own solutions to the problems we set each degree group. They maintained a video log and at the end of the week presented their team solution. I sat with great pride through 60 team presentations. That first cohort to experience our first-year challenge week have gone on to complete their second-year individual challenge week, as a welcome back from their winter break. Over 300 students spent 1 week working on their individual solution to the problems set, and those 300 students gave, on the Friday of

the week, individual presentations to a large team of academic assessors. In October this year, that same pioneering cohort, undertook their year 3 challenge week, held in the first week of the year. This time spending one week to rapid start their final year Capstone Project. Again, their achievements were measured, and individual feedback given to each, focusing on praising their creativity and imagination.

The clock ticks to my departure from the Indira Gandhi international Airport, heading for home. Those ticks are a small part of the ticking that takes us all through the 21st century. The people of Delhi and the surrounding area know all too well, through their recent experiences of the air quality issues, that action is needed.

They face a set of complex issues and conflicting priorities. A successful society is healthy and happy, elements sometimes forgotten in the drive for economic growth. Let us all embrace creativity and imagination to solve our 21st century problems, and if you will permit me to borrow words from Indira Gandhi, "Have a bias towards action - let's see something happen now. You can break that big plan into small steps and take the first step straight away." What steps will you take to build a wonderful 21st century?

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