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Why S'pore needs more people to study physics

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A waning interest in physics here has raised questions about how this will affect Singapore's economic progress. Amresh Gunasingham speaks to former chief defence scientist Lui Pao Chuen, who is trying to turn the situation around.

What is the level of interest in physics here?

We are fortunate in Singapore that more than 67 per cent of our kids complete their secondary education with a good maths and science foundation, and proceed to polytechnics, junior colleges and institutes of higher education taking courses in science, engineering and information technology.

We are fortunate to have young people who are not afraid of maths and science. In fact more than 80 per cent of every cohort does science at the A levels.

But there are dark clouds in the sky. The enrolment in physics in junior colleges has declined from 80 per cent in 2000 to about 40 per cent today. Something must be done soon to reverse this, or it will have serious consequences for our nation's economic development in all technology-related sectors, as well as other equally serious consequences for the nation's capabilities in key areas such as defence and education.

What can this decline be attributed to?

A brainstorming session was held earlier this year among members of a physics task force consisting of academics. A few areas were identified.

We found, among other things, that there was a perception among students that the subject was difficult to grasp conceptually, as well as one that was difficult to do well in during exams. Another reason identified was that teaching methods used may not be interesting, resulting in more students dropping physics through upper secondary, junior college and university.

Parents also play an important role. There is a misconception among some parents about the career prospects for physics graduates. They encourage their children to take up more professional courses such as engineering, which is perceived as having a more established base in Singapore.

Another factor identified was that the previous requirement of having to take physics for engineering courses at the Nanyang Technological University and at the National University of Singapore (NUS) had been relaxed.

Why is it critical for Singapore to have a reliable supply of graduates in the sciences?

Singapore has progressed from a labour-intensive economy in the 1960s to a technology-intensive economy in the 1990s. But clearly, the playing field was changing, with low-cost centres attracting industries to relocate from Singapore. Something had to be done. A ministerial committee under the chairmanship of Dr Tony Tan, then Deputy Prime Minister and Minister for Defence, concluded a decade ago that our economy must be transformed into one based on innovation and entrepreneurship. The Technopreneurship 21 programme was launched in 1999. The growth of research accelerated in 2006 with the establishment of the Research, Innovation and Enterprise Council, chaired by Prime Minister Lee Hsien Loong. The council provided strategic direction for national research and development, supported by the National Research Foundation.

This new economy depends on a reliable supply of graduates in science and engineering. With the transformation of Singapore's economy, there will be ample employment opportunities for scientists and engineers. Graduates in physics will be required as their problem-solving, analytical and experimental abilities will be much sought after.

Today's physicists are employed across a broad spectrum of careers because their education and training can be applied in academia and industry, and even in financial services.

Besides our need for scientists and engineers with a strong background in physics, we also need teachers to inspire our kids to understand and enjoy physics.

What can be done to reverse the trend?

The crucial age group to target is the 10- to 14-year-olds. Improving the teaching of science at the upper primary and lower secondary levels is key to ensure they continue with physics. We know kids are excited about computer games. So, for example, they could be challenged to learn physics through computer games, advancing to the highest levels in games by learning about various topics in science and physics. Then we can expect the competitive spirit of our kids to drive their learning.

Another possible reason students are uninspired could be because many physics teachers in secondary schools are not physics majors, but have engineering degrees instead. Though these teachers are self-motivated to learn more about physics, a more structured approach with formal courses, for example, a master's programme specially designed for physics teachers, would be very helpful. Our physics task force has recommended targeting 250 such teachers now for upgrading, and more in the coming years.

Among other things, we also recommended that the NUS physics department should target an annual increase of up to 15 students enrolled at the undergraduate level. This should be increased every year until the department has an annual enrolment of about 120 undergraduates, up from an average of 60 in the last 10 years.

A greater effort should also be made to emphasise the career prospects in a number of new industries. For example, the push towards developing a clean energy sector here in terms of using solar or nuclear energy will open up many new prospects.

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