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WITH waning interest in science, technology, engineering and mathematics (STEM) among school children, Malaysia may have to turn to foreign workers to help achieve Vision 2020.

Because if the number of science students continue to decline, we won't have enough engineers, architects, and other science-related professionals to take the country to the next level, academics and industry experts warn.

A nation can't be built by arts and business graduates alone, Malaysian Trades Union Congress (MTUC) secretary-general N. Gopal Kishnam cautions. He points to how South Korea and Singapore have overtaken us, and attributes the success to their emphasis on science.

"Fifty years ago, when we first started nation-building, we were on par with the other two countries. Where are they now? We're still a labour-intensive economy. It's because our neighbours focused on education."

With the Asean Economic Community opening the gates to allow free flow of workers between member countries, foreigners will flood the market as employers here start sourcing for skilled labour from outside the country, he predicts.

"I see more skilled workers coming in from the Philippines. The cost is at least 30% cheaper for local companies to hire them. Meanwhile, we aren't doing enough to stop the brain drain," he says, adding that close to a million science graduates are currently working abroad.

Robert Walters expects demand for ICT to surge in the next four years as new technologies enter the country.

"Processes are being automated and technology is moving rapidly so we anticipate an increase in demand for the relevant talent," observes Sally Raj, managing director of the specialist professional recruitment firm in Malaysia.

And failing to produce enough tech-savvy workers will result in us having to import from other countries, she says, agreeing with Gopal.

"I'm not surprised if they're willing to accept lower pay packets here because of the lack of opportunities in their own countries."

Already faced with competition from foreign architects, the Malaysian Institute for Architects (PAM) hopes the Government will give priority to locals.

Its president Mohd Zulhamee An says the demand for architects is high because there is substantial work, especially in the housing, education and health sectors.

There are some 2,000 professional architects in the country, he says, but the ratio between one architect against the population is 1:15,000 – far below the range of 1:4,000 to 1:8,000 Unesco recommends for developed nations.

"We need to double our numbers. To achieve the Unesco ratio, we must register 400 new architects annually over the next five years. But we're only registering between 50 and 100 new professionals yearly."

Attracting more engineering students is paramount for the country to implement and maintain the many development projects. Any shortfall of engineers will hinder the progress of the country, Institution of Engineers Malaysia (IEM) president Datuk Lim Chow Hock says.

# Nation builders wanted

Malaysia's dream of becoming a high-income nation by 2020 could crumble if we don't produce more science graduates in the next four years.

The National Council for Scientific Research and Development estimates that Malaysia will need 493,830 scientists and engineers by 2020. However, the Ministry of Science, Technology and Innovation estimates that there will be a shortfall of 236,000 technical personnel, he adds.

"Malaysia produces more than 10,000 engineers yearly but the quality of recent graduates is a concern," he says.

In September last year, the Academy of Sciences Malaysia warned that Malaysia faces a bleak future with only 21% of those in upper secondary choosing to study science subjects in 2014.

Utar research, development and commercialisation vice-president Prof Dr Lee See Wei is worried. There's an acute shortage of STEM workers, especially in electrical and electronic engineering and computer science and programming. And he expects the situation to get worse.

Demand for Utar's engineering and IT graduates has far exceeded supply, he shares, pointing to how top achievers receive multiple offers to choose from. Industry players often lament the shortage of STEM workers, he says.

He, however, says companies are expected to contribute from the get go because of the com-

mercialisation (Academic and International Affairs) Prof Datuk Dr Ahmad Shukri Mustapa Kamal says.

"We have no problems. Year in, year out, our STEM courses are packed full. For competitive programmes like medicine, pharmacy and dentistry, applicants far exceed the places offered."

Dr Lee foresees the situation worsening if nothing is done to spark interest in the sciences at school level soon.

"We have to figure out why kids are shying away from STEM, which is a global trend," he warns.

Utar is studying the declining interest in the sciences among secondary and tertiary students. It

school, even if students don't think they will end up in a STEM career. This is because a science student can always opt to study accounting or business at tertiary level but an arts student does not have the same flexibility to switch to a STEM degree at tertiary level.

"Students shouldn't limit their options. And, schools should let students with high interest in science take the science stream instead of just focusing on PT3 exam results to stream them. In the 1980s, students fought to be in the science stream. Now it's a challenge to fill a class."

Gopal Kishnam agrees. He calls on the Education Ministry to be "more flexible and open" when



The Star reported.

If this trend of upper secondary students shying away from science subjects continues, Malaysia can expect to face a shortage of science graduates in the coming years, the Higher Education Ministry cautions. Interest in pure science has been declining worldwide over the last five to 10 years.

Locally, we've seen an increased swing in upper secondary students applying for arts-related courses at institutions of higher learning, the ministry says in an e-mail reply.

The majority of post-SPM science students (88%), however, tend to pursue science- and technology-based programmes at tertiary level, with about 12% of science students choosing to study non-science fields like literature, economics, accounting, finance, business and management, the ministry reveals.

For the 2015/2016 academic year, a total of 40,438 students were offered spots in 20 public institutions of higher learning nationwide – 59.06% of which were science stream students, the ministry adds. And, once accepted into a public university, about 95% stay in the sciences, it notes.

petitive economy.

"To achieve the country's projected economic growth and industrialisation, we need more STEM graduates. Realising this, a 60:40 science/technical:arts ratio was implemented by the Government since 1970. We're drifting further and further away from the target.

"As we move up the value chain, we need more knowledge workers, especially in research and development. It will be difficult to meet the Government's goal of a STEM-driven economy by 2020."

We are still far from the 60% target, says Prof Dr Yang Farina Abdul Aziz, senior professor of Inorganic Chemistry at Universiti Kebangsaan Malaysia.

"There has been a drop in the number of science graduates. We have been seeing this trend over the years. A decade ago, there were about 70 students in my final year chemistry class. Now, my class size is down to half," notes Dr Yang Farina, who is also an Academy of Sciences Malaysia fellow and Malaysian Chemical Institute assistant honorary secretary.

Universiti Sains Malaysia (USM), however, hasn't seen a drop in STEM students yet, its deputy

will conclude its nationwide study next year. The trend, he says, was already evident from as early as 2012.

He estimates that the percentage of students pursuing pure science has hovered below 30% over the last few years.

From visits to schools and discussions with school heads, he says a dislike for mathematics is an often quoted reason. It could also be that students think STEM graduates have only the limited career options of engineer, scientist or doctor, which is wrong, he argues.

New opportunities are opening up every day within STEM industries, he observes. And many STEM graduates do very well in non-STEM fields because they're trained to be analytical.

For example, a banker with an engineering background will also look at investment projects from a technical perspective, which is an added advantage.

"STEM graduates branch out into fields like law and economics successfully. Instead of looking at their academic background as a waste, they see it an advantage."

He advises parents and students not to rule out the sciences in

streaming students.

Dr Lee thinks the delivery of science and mathematics needs improvement. "Otherwise, the lack of creativity will kill interest."

Students can't see how trigonometry, for example, can come in handy in life.

"That's why it's important for teachers to focus on applicability. Schools feed us students and we feed the industry. What can we do at tertiary level if there are no science students coming in?" he asks. "If the number of science students coming in is already low, and among them, more are switching to non-STEM degrees, how are we to produce knowledge workers for the country?"

An economy based on creativity and innovation needs human resources with strong foundation in mathematics and sciences, Malaysian Employers Federation (MEF) executive director Datuk Shamsuddin Bardan feels.

"We must move up the value chain and be more creative and innovative to transform the economy, he says.

"For example, we should be focusing on biotechnology to improve agriculture yield and

quality, and discovering alternative energy sources, but such projects must be initiated by the government.”

There must be a balance between STEM, Arts and Technical and Vocational (TVET) graduates based on current and future industry requirements. Initiatives under the 11th Malaysia Plan are projected to generate approximately 1.5 million new jobs by 2020, of which 60% needs TVET-related skills. But if we can't produce enough STEM graduates, our ability to retain and attract value-added, high value investment may be compromised, he warns.

In the United States, Japan and other developed countries who are ahead of the rest in fields like nuclear technology and space exploration, much of the work involved is driven by the government through specific research and projects.

Malaysia spends about 1.13% of its GDP on research and development. This is not enough, because developed countries fork out more than 3%.

Stronger governance structures in science and technology



### There's a mismatch between the graduates' skills and what the industry needs.

Prof Dr Lee Sze Wei



### More technicians rather than full-fledged engineers are needed.

Prof Dr Yang Farina Abdul Aziz



### If we can't produce enough STEM graduates, our ability to retain and attract value-added, high value investment may be compromised.

Datuk Shamsuddin Bardan



### To achieve the Unesco ratio, we must register 400 new architects annually in the next five years.

Mohd Zulhemlee An

## Definitely not for us!

DESPITE their science background, these students won't be graduating as engineers, architects or scientists.

Instead, they're opting for non-science degrees.

First-year accounting student Chia Chun Hui, 19, was never interested in the subjects but went to a pure science class because she "wanted to be with my friends".

She says at least half of her pure science classmates have opted to do degrees in the arts and humanities. The daughter of an accounts clerk has no regrets moving away from the sciences.

"My friends studying in fields like engineering and pharmacy are always so stressed out. I don't think I could have coped," she says, adding that she's very happy with her choice.

Tan Heng Fatt, 21, switched to an economics degree after doing his foundation studies in science.

"I knew nothing about accounts or economics but I'd spent eight months working as a

sales promoter and really enjoyed interacting with, and observing, people. The experience also made me realise that only by doing business can you become rich."

While he also enjoyed learning the sciences, Tan decided to see where his newfound passion would lead him.

Like Chia and Tan, Lam Zhi Hao, 21, was also a pure science student in secondary school.

Hoping to follow in the footsteps of his property agent brother, he's studying for a building and property management degree.

"I didn't think I'd do well if I pursued a science-related degree. There're so many calculations in science subjects ... the pressure is too high."

Meanwhile, an engineer who declined to be named, quit his job recently. The 27-year-old Penangite is heading to Singapore next week to become a hawk.

"After eight years in this field,

it's time for a change. The economy is slow. It's tough asking for higher pay here. I tried to apply for an engineering position in Singapore but bosses there say they can get two engineers from China for the salary I'm asking. So, I'll sell chicken rice there instead."

While his colleagues were surprised, his family was encouraging. They told him gaining new experiences is good as age is on his side.

He thinks he'll earn more in Singapore with a basic pay of S\$1,500 (RM4,500) and a commission of S\$0.50 (RM1.50) for every plate of rice sold.

"My accommodation, food and health care are all taken care of. The stall and ingredients are all provided."

Asked if he feels his science education is wasted, he says it's something he can always fall back on.

"Now, what's important is to earn as much as I can. I'm not bothered about job status."

## The science agenda

THE Government is striving to promote science among schoolchildren and their parents.

The Higher Education Ministry, Education Ministry, Science, Technology and Innovation Ministry, Malaysian Industry Government Group for High Technology (Might) and Academy of Sciences Malaysia are working together to stem the declining interest.

And universities, polytechnics and community colleges are actively working closely with schools to support the science, technology, engineering and mathematics (STEM) agenda.

"University students from these higher education institutions conduct workshops, seminars and programmes for students to increase their interest in the sciences.

"At polytechnic and community colleges, there's more focus on technology and engineering, where the Government has created more opportunities. For example, community colleges are offering programmes in gamification, tunnel drilling, and 3D animation.

"School science facilities are also being improved through collaboration among schools, universities and the industry. Here, higher education staff and students work with schools to physically rebuild science labs and, thereafter, volunteer their time to come and teach," the Higher Education Ministry says.

Prior to the 1990s, excellent Malaysian students had to take science subjects, leading to the high ratio of science to arts students. But in the 1990s, Malaysian upper secondary students were allowed to pursue their stream of choice.

This led to the ratio of science to art students in upper secondary schools narrowing, but now more students are taking a mix of science and other subjects, like

### We want to produce scientists who are good in philosophy, and engineers who are qualified in accounting.

Higher Education Ministry

accountancy and electrical design, the ministry explains.

"As our universities move ahead, students will have more opportunities to take non-science subjects as part of their courses. Flexible education is the future of higher education, and universities will be required to enable their students to be multi-disciplinary. We want to produce scientists who are good in philosophy, and engineers who are qualified in accounting."

The Institution of Engineers Malaysia (IEM) has been supporting government agencies in building awareness on science and mathematics programmes. The institution conducts career awareness talks, competitions and exhibitions in schools, its president Datuk Lim Chow Hock says. To educate the public on engineering opportunities, IEM will organise a construction career fair in April.

Job prospects for engineering graduates are bright as we become an industrial nation, he observes, pointing to how government allocation for infrastructure development has supported the country's demand for engineers.

Careers aren't limited to civil, mechanical, electrical, electronic and chemical engineering. Many new disciplines like aeronautical, environmental, maritime, mining, oil and gas engineering have

emerged, he says.

But, to meet the industry's evolving demand, engineering graduates must stay on top of new developments. Quality graduates are important as engineers are increasingly required to take on managerial responsibility requiring leadership and communication skills, he notes.

"There are indications that the Government – as the largest employer in the country – is incorporating a structured pathway for all science-based professionals, including engineers, to fill high positions in the civil service," he says, adding that prospects to reach the top, high remuneration and status recognition, will motivate students to take up STEM education and pursue a career in engineering.

But it's not all gloom, senior professor of Inorganic Chemistry at Universiti Kebangsaan Malaysia Dr Yang Farina Abdul Aziz says, pointing to the setting up of the Malaysian Board of Technologists (MBOT) under the Science, Technology and Innovation Ministry last year.

The statutory body will be tasked with setting up a training and teaching syllabus to enable 30,000 technicians and technologists to be recognised as professionals. The aim is to produce 384,300 technologists and technicians by 2020 following low percentage of professionals in the workforce. She feels that more technicians, rather than full-fledged engineers, are needed.

"But the industries and academia must have a healthy platform for discussions. Industries know the issues and what they want. Academia has the expertise," she says.



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