Shoring up Singapore’s Stem workforce

With more demand for workers trained in science, technology, engineering and mathematics, rethink how these subjects are taught to motivate students to join and stay in Stem-related jobs.

Andy Tay
For The Straits Times

Though the recent spike in community Covid-19 cases demonstrates anything, it is that Singapore will have to continue harnessing the effects of the global pandemic for the foreseeable future.

Our post-pandemic economy will be one where Stem (science, technology, engineering and mathematics) education is going to play an important role.

This is because many of the fastest-growing industries, such as biotech, semiconductors and green energy, require talent who are trained in Stem.

There’s no question that Singapore needs more Stem workers in areas like research, manufacturing and science policy planning than we have now.

This can be achieved by attracting foreign Stem workers, but there are risks when there is over-reliance on foreign labour, as evidenced by the need to close boarders in these current times.

Another strategy is to train more locals in Stem.

Unfortunately, a substantial number of local graduates do not continue in their Stem-related career paths. More can be done to meet these goals. Singapore’s response to this problem has so far largely centred on highlighting successful Stem graduates and making such jobs more attractive by boosting salaries.

As an assistant professor at the National University of Singapore (NUS), I am involved in outreach activities such as open-house and student recruitment events. Based on my observations, career prospects and salaries can influence what students choose to study. For instance, we have seen more students applying for computer science programmes than those of the tech industry.

However, most Stem industries cannot as much as tech companies, while emerging industries like biotech need more time to grow in the business ecosystem here.

To effectively boost retention of local students in Stem, there may be a need to go beyond the current narrative on career and salaries, to understand why most students would choose Stem subjects in secondary and pre-university schools but quit afterwards.

From my experience as a student and current role as an educator, I would say that students may enter Stem because their parents and teachers advised them to, and most choose to stay in Stem because they see a purpose in the field.

The good news is that based on the global State of Science Index survey by JM, a high percentage of Singaporeans trust (90 per cent) and agree that science education is crucial to the continued progress of society (79 per cent).

Here, I have some suggestions for motivating students to join and stay in Stem-related jobs.

Although these ideas are primarily targeted at reducing the number of students leaving Stem after pre-university and university, they could also be relevant in the earlier stages of education.

ENCOURAGE OPEN-MINDED LEARNING BY MOVING AWAY FROM WOOL‘W ANSWERS

The most fundamental ethos of science and research is to maintain an open mind. The common practice of memorising and being rewarded for “model” answers may cause students to become fixated on getting the perfect solution.

To encourage open-minded learning in the education system, we could create more opportunities for students to make use of evolving scientific knowledge. Common misconceptions and dedicated belief and reward them for thinking outside the box.

One example of evolving science is the role of bacteria in humans. Most of us have been taught from a young age that bacteria are disease-causing organisms and we should try to keep them out of our bodies. However, emerging research suggests that bacteria in our bodies can positively influence health, including responses to cancer therapy. At NUS, a number of researchers, including myself, are taking further research into how bacteria that came out and erase drugs into solid tumours.

To create open-minded learning environments, students should be given assignments that require them to challenge conventional scientific literature and debate one another.

Through such debates, they would be able to acquire critical thinking skills, such as evaluating the limitations of experimental studies. They would also learn to move away from “model” answers and accept ambiguity as part of many Stem-related jobs, and be more creative in non-traditional approaches to solve real-world challenges.

As more countries and research institutions enter into open-access agreements with publishers, students should find it easier to learn from cutting-edge peer-reviewed research.

No doubt this suggestion is going to require additional commitment from teachers and students, but can be rolled out and perfected with the patience and small, steady improvements to student populations before implementing a system-wide.

CULTIVATE A CULTURE OF RESILIENCE BY TEACHING THE HISTORY OF SCIENCE

It takes time for good research to be heard out and when students learn about scientific discoveries without the historical context of the immense effort they required, students might not appreciate the value of resilience to science. When we can learn from how scientific research easily yields immediate results, we are likely to become more patient and remain committed to their research endeavors for a longer period of time.

Building on the trend of online learning, students can be directed to resources such as OpenMind and biographies that engender thinking about the history of science before learning technical content in classes.

It can be helpful for curriculum planners and teachers to weave history into science education and encourage students to learn from platforms such as physical and online science museums.

I tested this idea during a NUS seminar when I taught the history of how cell biologists (especially) were discovered and why the giant squid is an important animal model to understand how neurons communicate.

I shared that because the giant squid has one of the largest and most neural and when you think about those structures, known as axons, that transmit neural signals to one another.

I shared with them that they found my approach refreshing, and many gave me feedback that they were able to better retain the concept I taught. The hope is that as students retain more, they would find them as appreciated, inspired by and dwell over the qualities of scientific education – breaking-down barriers, understanding how we can use patience and resilience – to prepare them for inevitable setbacks they may encounter during their education in science and research.

PROMOTE AND RECOGNIZE SCIENCE OUTREACH TO BOOST THE NEXT CLASSROOM GENERATION

Science outreach benefits society, especially students who might not have been exposed to Stem role models and even getting early recognition for their contributions.

The role of a researcher goes beyond publishing their work, to communicating and delivering the message of science to students, such as written articles and books that are easily readable while highlighting the potential contributions of science to society.

To conclude, students about Stem, I have partnered with my alma mater, Temasek Junior College, in these courses and are also more researchers from NUS to present more in these outreach programs.

As a Singaporean, we all share a platform for the pre-university students to receive mentorship and information about Stem from working scientists, who can be role models for aspiring researchers.

Institutes could band together to train and reward their researchers for efforts in out-of-classroom science outreach, thus boosting the interest of Stem students and retaining them.

GUARDING AGAINST COMPLACENCY

Singapore is investing record $25 billion in science and education, making Singaporean universities spend the next few years, but our budget still leaves us in comparison to that of bigger economies (even as a percentage of gross domestic product). In the next few years, the United States is planning to spend up to US$55 billion (S$73 billion), the European Union is committing a total of S$1 billion (S$16.7 billion) and China is also increasing its research budget, with the possibility of overtaking that of the US. Private companies in these countries are also more active in research funding than that of Singapore.

According to a report from the CSRC, Singapore has a primary strength in Stem and one of the highest density of researchers per million inhabitants. On this front, the city-state is currently ranked 10th in the world.

But when we compare ourselves with other major Stem research, such as Boston, San Francisco, London, Shenzhen, we know this could be improved.

More importantly, countries like China and India have a significantly larger domestic market, making Stem jobs easier to find, compared with places like the US and UK that has a developed economy and continues to lose out as the lifestyle continues to change.

In order to stay competitive, Singapore should further its commitment to investing in science, and continue to adopt an open-sourced labour policy to strengthen its Stem workforce.

In the meantime, we need to rethink how we are teaching Stem from the classroom and informally through outreach, to instil a deeper appreciation in our approach to nurturing future leaders in the Stem space.

* Andy Tay is a presidential young professor at the National University of Singapore. He is an IBM Fellow and is also an adjunct professor at INSEAD’s Asia Pacific Business School, and an invited professor at the University of Chicago.