A PUBLICATION BY THE MINISTRY OF EDUCATION, SINGAPORE

# CONTACT

MARCH 2020

FINAL PRINT ISSUE

THE TEACHERS' DIGEST

## OUR CHANCE TO SHAPE THE FUTURE

**Education initiatives to help our students seize the opportunities ahead**

What a start to 2020, eh? The new year is already testing our resolve in the face of volatility, uncertainty, complexity and ambiguity. They may not be the four horsemen of the apocalypse, but their collective name, VUCA, is often used as a catchall for, "it's a crazy world out there".

What does that mean? Perhaps Professor Lim Siong Guan captures it best when we discuss lifelong learning for "a world that keeps evolving, a world which... we cannot define". (See **p44**.)

One thing's for sure: technology's definitely involved. We've gotten used to the idea of blogs, social networks and search engines. You might have heard of IoT, the Internet of Things, where connectivity and computer chips are baked into objects that aren't computers in themselves – cars, cameras, coffee machines, clothes (Google it). One forecast, notes *The Economist*, is that by 2035 the world will have a trillion connected computers, built into practically every single thing.

We should be encouraging our friends and children to research the careers of the future, some of which are very exciting. Social robotics could be a big field for example (see **p51**). It's a blend of social anthropology, psychology and design. Then again, your current student could become a Chief Listening Officer (see **p52**), working on plans to help a company improve the way it is run.

You're probably becoming more aware of virtual assistants – Alexa, Siri, Hello Google, Cortana – listening to every word within auditory range. Artificial intelligence (AI), robotics and smart devices in the biotech and medical sphere are coming online. AI, in particular, is already changing education as we know it (see **p25** and **p29**).

The next big step for AI is the achievement of artificial general intelligence (or AGI), the point at which machines do think like humans. In 2013, experts were asked when they thought AGI may arise, and the median prediction was the year 2040. After that, some say, comes super artificial intelligence, the rise of machines, and the possibility of reaching the Technological Singularity – what computing pioneer John von Neumann described as a future point in time "beyond which human affairs, as we know them, could not continue".

That's thought-provoking for sure, and enough to spur us to our drawing boards and action plans. Thankfully, we can rely on our confident educators, who bring creative talent, imagination, intelligence, courage and resource to every problem (see **p16**, **p18**, **p20**, **p22** and **p46**).

Whatever the far future holds, there are plenty of reasons to be positive about 2020 and beyond. We hope the inspiring stories and smart ideas (see **p06**) in this special 36/37 double issue will get you thinking about the challenges and opportunities of the future, and our role in it. Whether it is a cool new world or a crazy new world, it is in our hands.

**The *Contact* Team**

**WHAT'S NEXT FOR *CONTACT: THE TEACHERS' DIGEST*?**

From April 2020, we're going online. Find our stories on Schoolbag.sg, under the "Teachers' Digest" tab (no joke!). We'll remind you with our monthly EDMs so you can keep abreast of the stories and voices of the fraternity.

Plus, Teachers' Digest will be helpful to unpack policy rollouts shared with you via the MOE Engage emailer, and its new section, Parent Kit (stuff to share with parents).


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Issue 36/37. March 2020

**Publisher**
Design Office, Communications and Engagement Group, Ministry of Education
1 North Buona Vista Drive, Singapore 138675
www.moe.gov.sg

Editorial Adviser
**RACHEL TAN**

***Contact* Team**

Editor
**KENNETH WEE**

Art Director
**KEN KOH**

Illustrator
**VEN WONG**

Comic Artist
**DON LOW**

Contributors
**MADHUSREE SINHA ROY, HEIDI YEO, GRACE CHIA KRAKOVIC, MARCUS WONG, GOH HONG YI**

Editorial Consultancy
**INKSPIRE GROUP LLP**

Access the archive
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COVER ILLUSTRATION: VEN WONG

# OUR CHANCE TO SHAPE THE FUTURE

Changing the PSLE, phasing out streaming and how students are placed in secondary schools, removing certain exams... here are the key changes put in place to help students seize the opportunities that lie ahead.

Last year was an action-packed year, which saw quite a few pivotal changes.

"The world is changing; Singapore is changing; the education system has to change with it, and go through that period of reform," said Minister for Education Ong Ye Kung in his opening address at the Schools Work Plan Seminar last September.

From rolling back the number of exams to announcing the roll-out of Full-Subject-Based Banding, which will change the way students are grouped in secondary school, the education system took some big steps to further enable every student, no matter what their background, to enjoy learning and grow in their own way and at their own pace.

These changes are being made with the future in mind. Just take that global juggernaut Amazon: Not content with having disrupted the concept of selling books, then all kinds of goods including food, Amazon is changing again.

As reported by *The Conversation*, a journalist-based website that tackles major issues around the world, a decade ago, a young man could have been recruited simply for his ability to heft packages around. But today, in Amazon's new mega-warehouses, this same recruit would have to be able to handle multiple robots and logistics systems. This would be for a basic, entry-level job, not even a managerial one.

"You can't stop the robots. The robots are already there. You might as well try to stop the sea," Mr Marc Tucker tells us. He should know. He founded the National Center on Education and the Economy, a think tank based in Washington DC, and has been studying the implications of global economic developments on education for decades. After 30 years at the helm, he stepped down last year to focus on research and writing.

When we asked him what we can do to robot-proof our children's future, he says, "What you can do is understand what kind of world those robots are going to create, and ask yourself, 'how can my child have a good life in that world.'"

In a December speech, titled "A Future of Hope", Minister Ong unpacked what it means for education to prepare Singaporeans for jobs of the future. "What we do know is that our young need to possess deep skills, especially humanistic skills, which computers and robots cannot easily take over. We also know that to develop skills, we need to tap into the diverse interests and talents of our young and make sure they hone those skills throughout their lives."

That encapsulates the direction we're moving in. Students have to be flexible to keep up with changes, to keep learning new ways of doing things, keep up to date with new technology, to use tablets, computers, work with robots.

> "WHAT WE DO KNOW IS THAT OUR YOUNG NEED TO POSSESS DEEP SKILLS, ESPECIALLY HUMANISTIC SKILLS, WHICH COMPUTERS AND ROBOTS CANNOT EASILY TAKE OVER."

One of the keys to keep students engaged, and indeed to keep teachers engaged in showing students the way, is to tap on their interests, loves and passions.

Here are some of the key initiatives to help our students learn for life and be ready to take on the challenges and opportunities of the future.

**1. Full Subject-Based Banding (Full SBB) will be piloted in 28 schools this year and rolled out to all schools by 2024.** It builds on Subject-Based Banding, which allows Secondary 1 students in the Normal courses to take English, Mother Tongue languages, Mathematics and Science at a more demanding level. With Full SBB, this will now include Humanities subjects: Geography, History and Literature.

A key change in the Full SBB schools is the re-organisation of classes. They will no longer organise classes according to streams. By 2024, the three secondary school streams will merge to form one secondary education course with many subject bands. This will remove the Express and Normal labels, and enable students to play to their strengths.

**2. Updates to the Primary School Leaving Examination (PSLE) 2021 scoring system.**

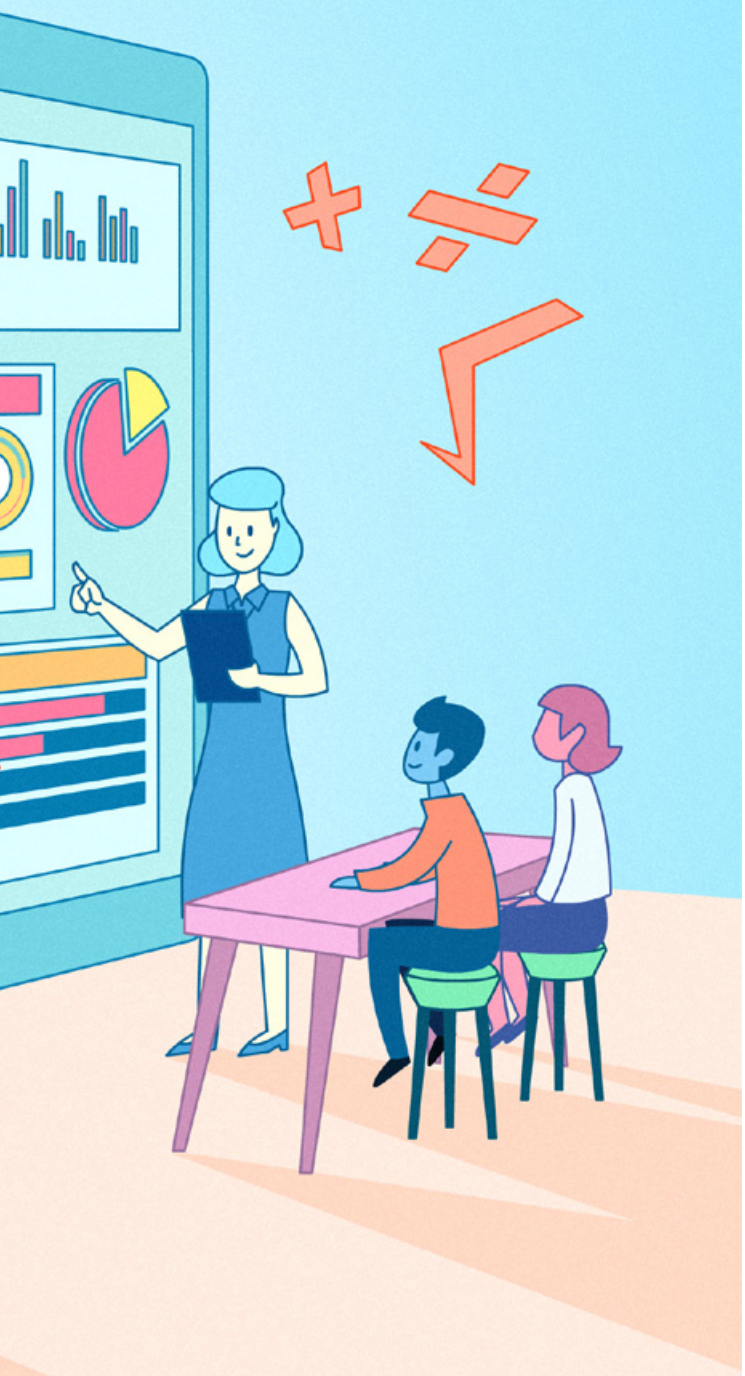
Under the new PSLE scoring system which will be implemented in 2021, students will be graded based on their individual performance in the subjects, regardless of how their peers have done. Starting from the 2020 Primary 5 cohort, schools will present the school-based examination results of all Primary 5 and Primary 6 students in Achievement Levels (ALs). This will help students and parents become more familiar with the new PSLE AL scoring system. These changes support our efforts to shift away from an over-emphasis on academic results, and provide our students with more flexibility and space to develop their strengths and interests throughout their education journey.

**3. The National School Games' Junior Division will implement a series of changes across all sports by 2021.**

These modifications include structural changes, such as award and recognition systems so more student-athletes can be recognised for their efforts, and technical changes, such as game formats to help the young ones master fundamental game and movement skills appropriate for their age group. The goal is to provide more opportunities for students to participate in more games, and enjoy sports as they grow up.

**4. More support for students with Special Educational Needs (SEN).**

Two intervention programmes that leverage peer support: Circle of Friends (CoF) for primary and secondary students, and Facing Your Fears (FYF) for secondary students will be extended to all mainstream schools over the next few years. To ensure that all Singaporeans have access to a school setting that best meets their educational needs, regardless of their financial circumstances, we have been working with SPED schools to further improve the affordability of SPED for families that have children with SEN. From



January 2020, six SPED schools will lower their fees by at least 25 per cent for Singapore Citizens. To address the growing demand for SPED school places for students with moderate-to-severe SEN who have Autism Spectrum Disorder (ASD), three new Government-funded SPED schools will be set up.

**5. Disadvantaged students will receive greater support.**
There are various schemes to assist disadvantaged students and their families. But some families still struggle, and this is when the Uplifting Pupils in Life and Inspiring Families Taskforce (UPLIFT) can step in. Initiatives include after-school care, programmes to build resilience, strengthening parental engagement and tackling absenteeism. All these will be done in collaboration with community partners, such as Self-Help Groups. An UPLIFT Programme Office will strengthen the coordination between schools, the community and government agencies to facilitate the collaborative efforts.

**6. Students can now take up the Language Elective Programme (LEP) in secondary school, apart from in Junior Colleges (JCs).**
Nine secondary schools will offer the LEP for Chinese, while three will offer the LEP for Malay, and another three will offer Tamil from 2020. The Malay LEP at the JC level will also be expanded to two more schools, while a new Tamil LEP will be introduced in two JCs. This two-year programme develops students' proficiency in the Mother Tongue Language (MTL) through the study of MTL Literature and activities such as camps and overseas trips. The LEP will enable our students to benefit from our multicultural background, deepen an interest in their Mother Tongue, and stay connected to our roots.

**7. Full-time undergraduate and diploma courses subsidised by MOE will be more affordable for Singaporeans.**
The Government subsidises around 85 per cent of the total cost of polytechnic education, and 75 per cent of the total cost of university education. From AY2020, eligible full-time and part-time students from lower- and middle-income families will receive bigger Government bursaries to help defray the remaining costs. There will also be a new income tier for the MOE bursary for part-time students. Singaporean undergraduates enrolled in full-time general courses at the two applied universities, SIT and SUSS, will also have their tuition fees reduced from around $8,200 and $7,900 respectively to $7,500 per year.

**8. More pathways for ITE students to deepen their skills.**
By 2030, MOE will provide opportunities for all ITE graduates to upgrade beyond a Nitec over the course of their careers. There will be more places in ITE's SkillsFuture Work-Study Diplomas and full-time Higher Nitec programmes. From April 2020, ITE is also adding 10 new Work-Study Diploma (WSDip) programmes. ITE graduates will now have 24 WSDips to choose from. About 70 per cent of curriculum time is conducted through on-the-job training at the workplace.

**9. Changes to polytechnic admissions**
A-level graduates who are looking to further their studies at the polys may now be exempted from the first semester – in order to enter the polytechnic in the same year they receive their A-level results. Currently, the polytechnic admissions exercises would have closed by the time students receive their A-level results. This change allows eligible students, who are not enlisting in National Service, to shorten their polytechnic course from three years to two-and-a-half years.

**10. Junior Colleges (JCs) with older campuses will be getting a major facelift in a few years.**
The majority of JCs were built or upgraded before 2002. Several of these campuses are now well over 30 years old. Starting from 2022, three JCs – Anderson Serangoon JC, Jurong Pioneer JC and Temasek JC – will be rebuilt, while Yishun Innova JC will be upgraded. New facilities include seminar rooms with moveable partitions and facilities that promote sports and co-curricular activities – such as indoor sports halls – which can be open to the community.

# THE CHANGE-MAKERS

The innovation that is taking place in Singapore's education is a system-wide affair. From game makers to automation experts, here are snapshots of the change-makers who shone bright at the 2019 Innergy Awards.

## ORGANISING CHANGE

MR SHAHREEN BIN AMAN, LEAD MANAGER,
FINANCIAL SYSTEM REDEVELOPMENT,
FINANCE AND PROCUREMENT DIVISION

MOE OUTSTANDING INNOVATOR AWARD 2019

When schools needed to replace an ageing financial system and switch to a new one in 2018, Shahreen was on hand to ease the transition.

He planned bite-sized briefings for schools, designed comprehensive training materials and videos, and created 'cheat sheets' for the systems' users. He also organised early-access workshops, trained the trainers and coordinated the collection of post-training feedback.

His patient and methodical approach was crucial to the successful switch, and ensured smooth use of the new system. Many of his practical solutions have been adopted by other departments for their own purposes.

## MAKING PHYSICS PHYSICAL

VICTORIA SCHOOL

*Titlee of Project: Nurturing the Joy of Lifelong Learning through Experiential Learning in STEM*

How do you let students explore the phenomenon of electromagnetic induction? For the teachers at Victoria School, the answer lies in recreating the experiment conducted by 19th century physicist Michael Faraday.

By using a simple cylinder of coiled wire and connecting it to a galvanometer, students can move a magnet back and forth inside cylinder – and discover that the movement of the magnetic field is what induces a current in the coil. Teachers construct such learning activities in an effort to make learning Physics more authentic, engaging and visible. These hands-on experiments complement lesson packages to further students' interest in Science, Technology, Engineering and Mathematics (STEM).

## LAB EQUIPMENT AT YOUR FINGERTIPS

CURRICULUM PLANNING & DEVELOPMENT DIVISION 1, AND EDUCATIONAL TECHNOLOGY DIVISION

*Title of Project: Promoting Joy of Learning by Turning Phone into Scientific Equipment*

Imagine turning every iPhone into a tool that students can use to study topics such as line spectrum or polarization in waves.

Tapping on the sensors found in smartphones these days, the team created web apps and 3D-printed accessories that can turn everyday mobile devices into scientific instruments such as sound and light analysers or radioactivity meters. They also created worksheets and videos to guide teachers on how to use these in class. During their research, teachers shared that it's important to use lab experiments to help students grasp the relevant science topics more easily, but professional equipment can be costly. Now, students can practically perform these experiments with their smartphones anytime, anywhere.

## SEEKING NEW SOLUTIONS

DR KONG WAI MING, LEAD SPECIALIST, COMPUTATIONAL ANALYSIS, NANYANG POLYTECHNIC

MOE OUTSTANDING INNOVATOR AWARD 2019

A true believer in innovation, Dr Kong has turned numerous tools into creative teaching solutions, earning 11 patents along the way.

When Dr Kong experimented with augmented reality (AR) technology, he saw its potential as a teaching tool. Colleagues joined him to create AR apps to teach graph plotting, electrical circuit connections, human anatomy, 3D chemical molecule structures and English literacy.

When visually impaired students requested a more accurate navigation system to find their classrooms' entrances, he persevered through many failed attempts to come up with a smart landmark navigation cane system that met their needs.


## SEEDING IDEAS FOR THE FUTURE

MS KAREN LOW, SENIOR TEACHER, METHODIST GIRLS' SCHOOL

MOE OUTSTANDING INNOVATOR AWARD 2019

Ms Low was instrumental in conceptualising her school's framework for Science, Technology, Engineering and Mathematics (STEM). Her goal is to make STEM concepts vivid for students, and enable teachers to teach the related subjects effectively.

She also forged strong partnerships with other institutions and organisations to collaborate on meaningful and authentic STEM-related experiences for students, staff and parents.

## CHAMPIONING TECH

MDM HO SU SIEW,
HEAD OF DEPARTMENT, ICT,
DUNMAN HIGH SCHOOL

MOE OUTSTANDING INNOVATOR AWARD 2019

Tech can elevate teaching. Guided by this belief, Mdm Ho started initiatives to introduce tips and tools for teachers to tap on Information and Communications Technology (ICT). She has also put in place processes to encourage collaboration on ICT-enabled curriculum packages and projects for students.

**Why is it important for teachers to keep up with ICT?**
"Rapid changes in the global, digital and education landscape are influencing how students learn. At the same time, these create new opportunities for teachers. By using ICT tools, teachers can engage students more deeply and create more immersive learning experiences."

**How can schools harness ICT in teaching?**
"Support teachers' professional development in using technology meaningfully. Build the capacity of the school's ICT and innovation teams, so that ICT is integrated into the curriculum, pedagogy and assessment. Showcase successful stories. Finally, motivate teachers to use educational technology tools to automate procedures and enrich student learning."

## NEW CODE OF CONDUCT

MR LOW CHEE WAH, TEACHER, BUKIT VIEW SECONDARY SCHOOL

MOE OUTSTANDING INNOVATOR AWARD 2019

In 2014, Mr Low created a Discipline Management System that cut down the time and resources needed to follow up with late-coming students. This was later enhanced with more features such as automated messaging to the students' parents.

In 2018, he led two other teachers in devising an Education and Career Guidance goal-setting system. It drew praise from both teachers and students.

Many schools have expressed interest in Mr Low's innovative solutions. He has gone the extra mile to share his programming codes, and his time to train others.


## APP-IFYING AWARDS

FINANCE AND PROCUREMENT DIVISION,
AND INFORMATION TECHNOLOGY DIVISION
*Title of project:* ***Smart Edusave Awards***

This is one of the first government initiatives to adopt PayNow for monetary awards. The project team worked closely with the banks to build a web application. Students at the Edusave Awards for ITE and Polytechnic tried it for the first time. They scanned their identification cards to mark their attendance, and immediately received their Edusave Award credited to their banks via PayNow.

Currently, students receive Edusave Award monies in the form of cheques. With the new application, students no longer have to wait two working days to receive the funds. This innovative initiative also reduces administrative processes, such as sorting the cheques, and following up on expired, lost or damaged ones.

## BUILDING ROBOTS TO SERVE

MR LI YINBEI, SENIOR MANAGER, NGEE ANN POLYTECHNIC

MOE OUTSTANDING INNOVATOR AWARD 2019

Better ageing with robots – that's the goal that has animated Mr Li's development of two service robots thus far.

RoboCoach, his first invention, was initially used to guide and motivate the elderly to exercise, earning a mention by the BBC news service as Asia's first human-sized exercise coaching robot. It has since been improved so that it can teach seniors English and Bingo too.

Elderly people living alone can also rely on his Telebot LISA, short for Loyal Interactive Service Assistant, for companionship and to stay in touch with caregivers remotely. Yinbei has also worked with Hougang Primary School on a humanoid educational robot.

## ROBOTS TO THE RESCUE

STUDENT PLACEMENT & SERVICES DIVISION

*Title of project: Robotic Process Automation (RPA) for Service Improvement & Workflow Enhancement*

A team at SPSD created three Robotic Process Automation (RPA) bots to manage repetitive and time-consuming tasks. The first equips frontline customer service officers with a tool to sign into four information portals almost instantaneously. This speeds up access to information that can address customers' queries.

Another bot compiles and sends emails for an annual user verification exercise that covers 342 schools and 17 headquarter divisions. The third bot keys in financial data from exercises such as the collection of school fees, and helps officers generate end-of-day reports. The project team developed these bots from scratch. With minor tweaks, the bots can also be used in other divisions, schools and Statutory Boards.

## INTERESTED TO ADOPT ANOTHER SCHOOL'S PROJECT?

The Organisation Development Branch (ODB) provides a co-funding of 75 per cent (capped at $5,000) via the Innovation Adoption Platform (IAP) Fund to MOE Schools for the adoption of good projects from MOE Innergy Awards.

Visit http://intranet.moe.gov.sg/Innovation/Pages/iap.aspx to see the projects available for adoption.

For more information on the MOE Innovation Fund, please visit http://intranet.moe.gov.sg/Innovation/Pages/mifschools.aspx.

## THE PEDAGOGY EXPERIMENTER

MR MUHAMMAD FAEEZ BIN RAHMUDEEN, TEACHER, PRESBYTERIAN HIGH SCHOOL

MOE OUTSTANDING INNOVATOR AWARD 2019

"Dare to try" is Faeez's teaching philosophy. Since 2017, he has spearheaded project-based learning in Presbyterian High School's Lower Secondary Normal (Technical) Syllabus. He also champions the use of technology in teaching and learning.

**Why is it important to try new ways to engage students?**
"Students have different learning styles. Many are also digital natives today. To capture their interest and attention, we have to innovate in our teaching practices."

**How does project-based learning help to engage students?**
"When students can apply what they have learnt, they become more interested in the subject. They can also work in groups on projects, which gives rise to collaborative learning."

**What are some examples of projects and tasks you designed for students?**
"One example is when they were tasked to craft a solar oven using recyclable materials and test its effectiveness. They applied the concepts of heat transfer in their designs."

**What other novel pedagogical methods have you tried?**
"I used card games to teach qualitative analysis and organic chemistry. The games were developed from scratch and are a fun and meaningful way for students to consolidate their learning."



## BETTER LEARNING ON THE CARDS

UNITY PRIMARY SCHOOL

*Title of project: Instilling the Joy of Learning with Board Game Line It Up!*

Words are the main building blocks for constructing sentences – an idea that goes from literary to literal when students play 'Line It Up!' during Chinese Language classes. It's a board game developed by the school. Students create sentences by placing vocabulary cards in an order they think is grammatically and logically correct, and score points if they are right.

The game is based on the Primary 1 and 2 Chinese Language Syllabus. Playing it helps to build students' vocabulary, while letting them revise and understand sentence structures in an enjoyable and self-directed way.

The idea is to provide a foundation for them to work towards writing complete sentences.

## IMPROVING THE WORK EXPERIENCE

MOE OUTSTANDING INNOVATOR AWARD 2019

MR ALEX GOH HIAN PIN, MANAGER, OPERATIONS DEVELOPMENT / RECRUITMENT CENTRE, HR SOLUTIONS AND CAPABILITIES DIVISION

Tech can make light work of time-consuming and painstaking tasks.

**You've used macros and robotic automation processes for daily operations. Tell us more.**
"By using robotic automation, we cut the time it takes to change a job applicant's status in Careers@Gov from 30 seconds to 10 seconds. This makes a big difference because we receive about 70,000 applications each year, and each applicant's status can change up to six times as they progress or not. The automated process is also less prone to human error.

"When we moved from the Teacher Recruitment and Selection Service to Careers@Gov, my colleagues also had to manually retrieve and compile data from different sources, shortlist positions and monitor the entire process. We built a tool to consolidate information with one click of a button. The entire dashboard can be shared with processes downstream."

## CHEMISTRY TRAILBLAZER

DR SUBRAMANIAM GURUSAMY, SPECIALIST AND SENIOR LECTURER, NANYANG POLYTECHNIC

MOE OUTSTANDING INNOVATOR AWARD 2019

Dr Subramaniam sees opportunities in natural product and analytical chemistry to solve problems.

His accomplishments include a method to increase the safety of Traditional Chinese Medicine extracts, economical extraction protocols to achieve high yields of desired products, and numerous industry projects, patents and publications.

A dedicated teacher, he has also used his industry research projects to sharpen students' knowledge and laboratory skills, and trained over 40 students in invention projects, helping to shape the next generation of innovators.

# UNEXPECTED IDEAS

The art of teaching requires adaptation, insights, empathy and intelligence. Two teachers share just what it means to see opportunity and make changes in their classrooms.

## Learning from their mistakes



BY **MR BENJAMIN POOI**
CHUA CHU KANG SECONDARY SCHOOL

As a teacher, I often have to go through assignments with my students. I used to show them the correct answers when doing so. Each time I did this, I would ask if they needed any clarification. The class would then be silent, which made me wonder: Could they all have learnt from their mistakes? Were they really satisfied with the suggested answers?

Deciding to try a different approach; I graded students' assignments without revealing the suggested answers. I asked them to enter the answers into an online form which would give them a grade, identify which questions they answered incorrectly, and no more. I told them to re-attempt those questions. What happened next surprised me. Instead of keeping quiet, they began feverishly asking one another why they got a particular question wrong, and clarified their doubts. One student even came up to me proudly claiming that he managed to correct all his mistakes by himself.

Encouraged by this, I explored how I could re-create the same experience for group assignments. Instead of submitting individual responses, I asked my students to work in groups, evaluate one another's answers, and come up with one response. That was when I saw them take charge of their learning and share their viewpoints with one another. How far they had come!

## CREATING A SAFE ENVIRONMENT FOR GROWTH

Of course, just putting students in groups alone is not enough to make them learn. Everyone in each group has to feel comfortable with their group-mates, in order to participate effectively in discussions. To ensure this, I asked every student for a list of their friends in class, and used it to determine the seating arrangement.

It worked. One student told me: 'I feel very comfortable sharing with my friends that I do not know how to do certain questions and I am no longer afraid to clarify my doubts with them.'

At the same time, in order for the classroom to be a safe space for growth, I placed special attention on how my students managed their interpersonal relationships. Rather than letting my students stay in their cliques, I got them to reach out to other classmates. I got every student to write words of gratitude to one another.

Despite the initial awkwardness, the students eventually became more comfortable showing their gratitude to others. When one of my students received these words of gratitude from his classmates, he started crying happily and shared that he had never felt so appreciated before. Such activities touch students' lives, and help them realise how little acts of kindness can have such a huge impact on others' lives.

Having established this safe environment for learning, I set about cultivating a spirit of reflection in my students. After every term, my students will reflect on their learning and write about it in their personal portfolios. This allows them to track their growth over the course of the year.

A colleague and I worked together to initiate student-led conferences during parent-teacher meetings. Using their written reflections as a guide, our students led discussions with their parents about their growth and learning over the semester. A parent told me he was very pleased that his child was taking ownership of his development and making plans for his growth. Due to its effectiveness, this initiative caught the attention of our teachers, and in 2017, it was implemented for the whole school.

## TEACHER NEEDS TO LEARN, TOO

With learning happening two-way, I, too, have learnt from my students. I decided I had to walk the talk; every term, I will request for feedback from my students through an anonymous survey, on their classroom climate as well as on my teaching strategies. Analysing their feedback on my areas of improvement is always a humbling experience for me. It is even more humbling to share the results with my students, and to let them know the goals for improvement I am setting for myself, in order to role-model the process of goal-setting.

Once, my students felt that they were not given enough opportunities to speak up and share ideas in class. In response, I conscientiously infused more of their voices into my lessons. Once students saw that their voices mattered, they felt more empowered. With the firm belief that every child is capable of success, I feel it is my duty to set them up for it by creating a safe environment. I want them to eventually take charge of their own development, and to effect positive changes in their community.

A version of this article was published in Schoolbag.sg with the headline "Teaching Your child to Be the Teacher".

# The caterpillar hunt

BY **MS DONICA TANG**
CANTONMENT PRIMARY SCHOOL

Having breakfast with my students during recess is usually a happy affair. That day, however, Sarah* was on the verge of tears. 'Ms Tang, I feel sad.' When I asked her why, she said a friend had told her he was getting a dog for his birthday and she knew she would never have a pet because her family could not afford one.

The conversation made me realise that at least half of my class might not get the opportunity to care for a pet.

As I planned my English lessons for the book, 'A Butterfly is Born', an idea came to mind. I could bring the storybook to life and, at the same time, give Sarah and her classmates an experience they might never have. It was time to go caterpillar hunting!

'Are those caterpillars?', 'They are so cute!', 'Why are they so tiny?' Excitement filled the air when I stepped into the classroom with two little caterpillars in a jar. Over the next few weeks, my students adopted the caterpillars as class pets, named them Burpy and Ronaldo, fed them fresh leaves, and even cleared out the droppings. The caterpillars grew bigger, began molting, and became pupae. Some students researched on the different species of butterflies in Singapore and tried to guess which would emerge from the pupae. Others had discovered how long each stage of the life cycle was and were predicting when the butterflies would emerge. There were even a few who had delved into the life cycles of other insects, which they found fascinating, and were eager to share with the rest of the class. For Sarah, she had stapled pieces of rough paper together to form a scrapbook with dates, illustrations, and captions that chronicled the life of her very first pets.

Rather than simply reading a story about butterflies, my students had first-hand experience with them and were inspired to learn about them on their own. This would help them see learning as a lifelong journey of discovery. Like the beautiful Common Mormon butterflies that emerged, my class had likewise transformed.

## MAKING MATHEMATICS COUNT

My next challenge was helping these young minds realise that everything they were learning was relevant to their daily lives. Often, they merely apply the content knowledge from Mathematics lessons and textbooks to answer the questions from their workbook or worksheets. I did not want my students to learn with such a narrow mindset. I wanted them to make the learning of Mathematics count.

My colleagues and I, thus, initiated a Math Scrapbook project where students become active learners and apply Mathematics creatively in familiar settings. Each child could explore the subject in the canteen, supermarket, at home or around their neighbourhood by choosing tasks related to the topics they were learning. Then, they would document their findings in a scrapbook. For the topic, 'Addition', they counted the forks and spoons in their kitchen, drew them, and wrote an equation to show the total number. For 'Subtraction', they recorded the ages of their family members and found the age difference between the oldest and youngest member.

The students' responses were heartening. One parent said she was overjoyed to see her son so enthusiastic about the project. "It helped Ethan* understand that Math concepts are not only for exams or worksheets but can also be used in day-to-day life."

We had successfully created a platform

for authentic learning but we also had our fair share of struggles. Firstly, we had to design differentiated levels of tasks for each topic to encourage the lower progress learners while also challenging the higher achieving ones. Secondly, I was mindful that the materials for each task had to be simple items available in every household, so that every child, regardless of socio-economic background, could attempt the tasks.

This ties in closely with my teaching philosophy. I believe that education is for all, regardless of the student's background, aptitude for learning, or motivation to learn. In my classroom, I promote inclusiveness and equity by ensuring that those with special needs are well integrated, lower progress learners are given additional resources to bridge the gap, and those who favour certain learning activities are provided with meaningful opportunities.

## THE FLOWERING OF VALUES

Above and beyond their academic subjects, I want to inculcate moral values in my students. I found that sharing storybooks portraying values like respect, graciousness, and integrity help students to internalise and exemplify them. For instance, we read 'Chrysanthemum', a story by Kevin Henkes about a young mouse who cherished her unique name until her classmates made fun of her for it. While listening to it, the children took turns to crumple a large, red paper heart each time Chrysanthemum's feelings were hurt by something mean her classmates said or did. At the end of the story, my class tried to mend the torn and crumpled heart but could not. They realised the irreversible impact of their words and actions. 'Before you speak or act, think and choose to care. It is hard to fix a wrinkled heart.' When I overheard my student say this, my heart was full.

My students are now more inclusive and know how to be kind to one another. They have realised that, beyond good grades, what is more important are values that would shape how they live their lives in future.

*Names have been changed to protect the identities of the students.

A version of this article was published in Schoolbag.sg with the headline "Caterpillars and Chrysanthemum".

# Making Grades a Journey

Principal of Clementi Primary, Mr Albert Chia, shares how he makes assessment in school an on-going process, focused on developing children into lifelong learners.

PHOTOGRAPHY **VERNON WONG**

At Clementi Primary School, students can choose to retake some online quizzes – in the comfort of their own home, as and when they are ready.

Will this tempt some to have a tutor or parent present to ensure they get full marks?

Yes, says Principal Mr Albert Chia. That question often comes up during his networking sessions with parents.

"I'll usually respond that I'm fine with it," he says, which tends to take the parents in the room by surprise. "Then, I'll add that the child is not deceiving me or the teacher, but deceiving themselves. Because by the middle of the year, they will find that they are unable to cope."

Upon hearing Mr Chia's response, parents would all start nodding their heads in support.

Re-takes or re-tests in the school are just part of an approach to assessment that focuses on developing mastery rather than academic results. In this way, students can build the metacognitive muscle they will need to become lifelong learners. The school is also constantly refining their approach to assessment, so none of it is set in stone.

***Contact:* How do re-tests encourage greater intrinsic motivation to learn, and student ownership of learning?**

**Mr Albert Chia:** Allowing re-takes removes some of the negative emotions associated with assessment, such as anxiety. That has many pluses for children's psychological well-being. It also reduces the excessive pressure associated with assessment, in the sense that a child has only one chance to do this test to get that grade. It is important for students to see assessment as part of learning, which helps them to improve their learning. At the same time, this also encourages students not to give up if they failed on the first try.

When students request for a re-test, they are showing us that they want an opportunity to improve and do better. It is then observable that they have motivation and ownership for learning. Our challenge is with students who are happy with just a passing mark, or find re-tests too tedious. For these children, we know that we need to develop in them a growth mindset and increase their motivation to learn.

***Contact:* What are some recent changes you have made in your school's assessment approaches?**

**Mr Chia:** We advocate student empowerment. Last year, we took around a term to develop student self-assessment rubrics. The Student Development Team started by creating the rubrics based on the Desired Outcomes of Education and the Framework for 21st Century Competencies. Then, the academic heads and senior teachers gave their input.

We currently have a one-page form that is not too complicated, and can be used from P1 to P6. It includes a rubric for students to rate themselves on Content Mastery, Critical and Inventive Thinking, Growth Mindset and Learning Motivation, using descriptors written in child-friendly language, 'Not Yet', 'Getting There', 'Got It' and 'Wow!' Each descriptor is accompanied by an emoticon. This rubric can be adapted for all subjects.

Students also reflect on how well they have achieved the Learning Outcomes for the subject - what they are able to do and how they can further improve their learning.

***Contact:* How do teachers ensure that assessment rubrics are student friendly, and that students truly benefit from using them?**

**Mr Chia:** We designed it from the child's point of view, with the child in mind. The children must understand it, in order to be metacognitive and to attain self-actualisation. The rubric helps children know what they have attained or mastered, and what they are strong at. They can also draw on the rubric to identify and reflect on the areas that they want to work on.

Typically, rubrics might use language like, 'Not observed', 'Developing', 'Competent', and 'Exceptional'. However, we allow students to say, "Not yet!" It signals more clearly to children that they simply haven't mastered the content yet, not that they can't do it. We deliberately embedded the growth mindset in the descriptors for our rubrics.

People may question if such a rubric, with smiley faces, is too childish to be used by professional educators. But if you see it from the child's point of view, such a rubric is non-threatening.

> "ONE BIG UPSIDE TO OUR EFFORTS IS THAT THE CHILDREN ARE HAPPY. THEY LOOK FORWARD TO COME TO SCHOOL."

***Contact:* What has been the response to the self-assessment rubrics?**

**Mr Chia:** At this point in our journey, after about one year of using the self-assessment rubric, we discover that there is a need to give teachers space to customise and improvise the way they use the form to suit their students' learning needs. For example, some upper primary teachers would use the descriptors of the four-point rubric when marking students' work without asking them to fill in the one-page form.

From a parent's point of view, you can easily see that your child is putting in the effort and making progress even if they are still mastering the content. We should encourage students to be more proactive in their studies. It's much better for a child to go, 'Teacher, I need help in solving these kinds of problems' than wait to be told what to do.

One big upside to our efforts is that the children are happy. They look forward to come to school. That assures the parents that their child is motivated even if the marks may not look so good. Most parents, deep down inside, want the well-being of the child to be taken care of first.

# Good Habits Beat Any Crisis

A conversation with Ms Cheong Hwee Khim, Principal, Farrer Park Primary on how constantly reinforced habits will take you through any situation in life.

PHOTOGRAPHY **VERNON WONG**

All students at Farrer Park Primary school start their day off the same – with a cheerful greeting from Principal Cheong Hwee Khim, and sometimes, a big hug too. That's her way of helping them start the day off calm and happy.

"One thing that I think is very important, is to start the day calm; to start it happy. So when we stand at the gate to greet them; that really helps. That has been a practice for years in this school, and I feel that connection with kids is important, so I try to greet them by name," says Ms Cheong.

Ms Cheong remembers the name of every student who passes by, dropping words of encouragement to those who seem to need a little extra perking up to start the day.

As the principal of the school, she's also instituted that soft music be played throughout the school in the mornings. Ms Cheong says this helps to maintain a calm, pleasant atmosphere in the school and this was certainly the case when we dropped by.

***Contact:* I must imagine things have been a little stressful recently with the COVID-19 virus outbreak. How are your students coping with the measures thus far?**

**Ms Cheong Hwee Khim:** Well, life goes on for the children, so what we need to teach and continue to reinforce to our children is 'Take care of yourself, take care of yourself, take care of yourself.' And I think it must be part of their growing up years so then when they grow up, they learn to take care of themselves, and the people around them, too. That's taking care in terms of personal hygiene, washing your hands, sneezing into a tissue. When you're not well, you see a doctor and rest well. These messages have been sent to them all the while, and not just because of the recent virus. And that's helpful as we just continue to reinforce the messages.

***Contact:* And how about your staff?**

**Ms Cheong:** My teachers are great. And it helps that we have a very strong culture of professional care in Farrer Park.

During this current period, my teachers are managing themselves; role-modelling for the students. As adults, we're more conscious of ourselves, so it's easier. But our teachers also want the children to understand that while we can't manage the virus, we can manage ourselves.

It's also important to keep the children calm and not get overly anxious. So, we teach them to be mindful of fake news, to be nice to one another, and not to discriminate against anybody.

***Contact:* What do you mean by "professional care"?**

**Ms Cheong:** That means: Care for safety, Care for well-being and Care about learning. This is a shared belief the school has as a team of educators, including my non-teaching staff. I don't just call it a culture of 'care' but really it's a case of professionalism because we're all teachers, and we want to make sure we know what we mean by 'caring for students'.

That's why we articulate it three ways – safety, well-being, and learning. It's ingrained in the minds of my teachers. They all know it. They're all educators so it easily resonates with them that we must take good care of the children.

"LIFE GOES ON FOR THE CHILDREN, SO WHAT WE NEED TO TEACH AND CONTINUE TO REINFORCE TO OUR CHILDREN IS 'TAKE CARE OF YOURSELF, TAKE CARE OF YOURSELF, TAKE CARE OF YOURSELF'."

# THE JOY OF LEARNING ECONOMICS

Mr Koh Weining and Mr Gilbert Ng are friends who teach Economics. So when they get a chance to catch up, they would be discussing new ideas to make approaching the subject relatable and engaging. Here's a glimpse into their world.

**MR GILBERT NG,** HWA CHONG INSTITUTION

How would you make concepts that are abstract more real to students?

For Economics educators Mr Koh Weining and Mr Gilbert Ng, the answer lies in tapping on the game-changing opportunities that technology offers.

Last year, the two teachers received the Outstanding Economics Teacher Award, given by the Economic Society of Singapore, for their contributions to the teaching and learning of the subject.

We sat down with the both of them to hear their perspectives, starting with helping students understand abstract concepts.

**Mr Gilbert Ng:** For students, it can be weird to look at the world in two-dimensional graphs. As teachers, we have to show how such abstract models are like maps that help us navigate the real world.

**Mr Koh Weining:** One way to make abstract concepts more concrete is asking students questions they can relate to. In Temasek JC, we'd ask questions like, 'Why do Singaporeans pay one of the highest fees in the world to watch the World Cup?' Students will answer based on their intuition. Then, we bring in the concept of monopolies and price discrimination across different countries. This makes the subject real for them. Tech helps too. Now we've got tools like Mentimeter to collect students' responses. This is actually stored data, which I can pull out later to help students make sense of their earlier responses.

> "'WHY DO SINGAPOREANS PAY ONE OF THE HIGHEST FEES IN THE WORLD TO WATCH THE WORLD CUP? STUDENTS WILL ANSWER BASED ON THEIR INTUITION. THEN, WE BRING IN THE CONCEPT OF MONOPOLIES AND PRICE DISCRIMINATION ACROSS DIFFERENT COUNTRIES."

**Mr Ng:** That's cool! I tend to do this only once at the start of lessons. But you can map the change in students' thinking as you teach. I should try it too.

**Mr Koh:** Yeah, sometimes their comments can trigger follow-up questions I can ask. So the lesson becomes a collaborative effort.

**Mr Ng:** I try to promote more collaborative work as well. For example, I will use Google Slides, and break up the class into groups and assign each group a slide to work on. Groups might discuss, for example, whether protectionism is beneficial. Then they will scope an essay and fill out their slides. Teachers can see students' learning gaps, while the exercise allows students to build up their knowledge together.

**Mr Koh:** Ah, I've always done these exercises on the whiteboard. It doesn't work very well.

**Mr Ng:** Indeed. If you get four people to work on the whiteboard, the other students may not be paying attention. But with Google Slides, everyone is involved. The point is, we're not looking for perfect answers. We just want students to learn to scope an essay with their current level of knowledge. With this, I can add on more information to bring things to the next level.

**Mr Koh:** We're trying to do this in TJC at the lecture level. Before the lecture, we get students to complete simple multiple-choice questions on the Student Learning Space (SLS). Answers to the questions can be found in the lecture notes.

For students who haven't done their SLS homework, we'll ask them to complete the set of questions before joining the lecture. Eventually, everyone will read the notes before the lecture.

With this, I can break up the lecture into parts, and focus on tackling concepts that are more difficult. Start with the questions that many students got wrong. For example, most students won't get tariff diagrams. So, we'll do a 10-minute lecture on that. Students are more engaged when we break up a 60-minute lecture into 'mini lectures'. We can also insert quizzes to highlight common misconceptions. This makes the lecture more hands-on in the sense that students are less passive in building their knowledge.

I'm trying to scale this up slowly, taking into account the resource development that needs to be done. My challenge for 2020 is to make this a whole JC 1 learning experience.

**MR KOH WEINING,** TEMASEK JUNIOR COLLEGE

**Mr Ng:** It's quite similar for HCI. We combine gamification and flipped learning to create "gamified flipped learning modules" for three- or four-week periods in JC 1 and JC 2. I credit my Principal Consultant (HOD) for making the bold move to remove lectures and go for this self-paced system. Essentially, we have an game app with multiple-choice questions that gradually get more difficult. It's an effort-based, self-paced progression. For example, I can assign a set of modules for economic growth, unemployment or inflation to run across three or four weeks. Then, it's up to students to pace themselves in completing the modules. Each time the students complete a module, they will gain 'experience points' and 'level up'. For those having trouble keeping up, the teacher can adjust the amount of work.

More important, I can understand my students better. Now, I will spend five to 10 minutes with small groups of students with similar progression rates to find out where they are with the assigned tasks, and address their queries. It's like having a consultation session every lesson. I talk to them more. I get more information. One type of data I would love to collect is who asks more questions, and the quality of their questions. The ability to ask questions is evidence of good cognition.

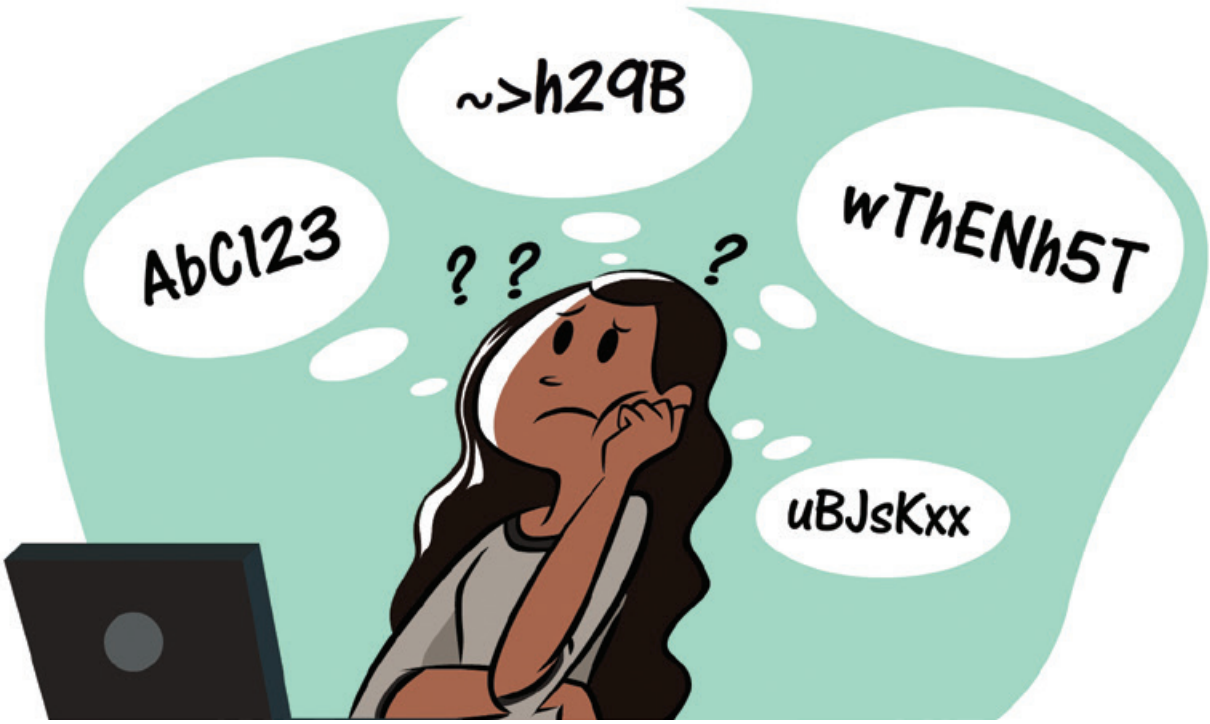
> "IF WE WANT TO ENCOURAGE LIFELONG LEARNING, THIS KIND OF SELF-PACED, SELF-REGULATED TYPE OF LEARNING IN SCHOOLS SHOULD BECOME THE NORM."

**Mr Koh:** It helps to have a whole-of-school approach to get students to be more engaged through the deliberate use of ICT. There can be discomfort if students have to switch between different modes of learning for different subjects. In this regard, it is very heartening to be in an innovative community of teachers in TJC where many different departments are concurrently testing possibilities on SLS and other online platforms to increase engagement in our lessons, and learning from each other in that process.

**Mr Ng:** Many subjects in my school are moving towards a flipped classroom way of teaching and learning. Students can get used to it quite quickly. If we want to encourage lifelong learning, this kind of self-paced, self-regulated type of learning in schools should become the norm.

# A word from the wordsmiths

If you could add one word to the English Language, what would it be? We invited recipients of the Inspiring Teacher in English Award to invent a word that describes a 21st-century phenomenon, and define it.




Advertising. Belongings. Cold-blooded. Dishearten. Eventful. Fashionable. Generous.

These are a few of the many words in English language credited to William Shakespeare. Some say he invented as many as 2,200 words. However, one thing is for sure: he certainly wasn't the last to create new words.

In 2019, the Oxford English Dictionary created well over 2,000 new entries. The additions cover a lot of ground, some of which are actually familiar – from chillax to cryptocurrency, to Jedi and lightsabre.

Moreover, whatever your stand is on Singlish, the Oxford English Dictionary currently recognises 27 Singaporean terms, including kiasu, lepak and shiok.

So if you're ready, sit back, chillax, and try letting these words trip off the tip of your tongue.

## MY WORD: PWFUSION

By Ms Shanthi Deenathayalan, Guangyang Primary School

Many of us these days are bogged down with so many passwords. We access online platforms like social networking sites, and entertainment portals like Netflix. We do banking online, and we use intranet portals at our workplace. At times, we forget our passwords and are confused as to which password we used to access the account.

A perfect word to describe this feeling would be 'pwfusion' – pronounced P-W-fusion.

## MY WORD: SOMNAMBULITIS

By Mdm Marianne Cheong, National Junior College (Secondary Section)

The word I would like to contribute is 'somnambulitis'. It is made up of: somnus (sleep) and ambulare (to walk), with '-itis' indicating a sort of medical condition. This comes from my observation of – firstly – people walking about in a heightened state of unawareness – almost as if inflicted by a sleepwalking illness. Second, students who are so severely sleep deprived that they may as well be suffering from a sleep-walking illness.

Third, people feeling helpless against this state – they 'cannot help it' – when actually they can by getting sleep, by looking up from their handphones, by not rushing about and just becoming more aware of their surroundings.

I also enjoy the mouthing and sound of the word som-nam-byuh-ly-tis. The juxtaposition of the 'm' and 'n' sound, and the emphasis on the second syllable of a five syllable word requires thought and deliberation in pronunciation. The word sounds like the feeling you have when afflicted: your movements and thoughts are heavy, slow, ponderous – like the word 'lugubrious'.

## MY WORD: TECHNOTALK

By Mdm Uma Perumal, Montfort Junior School

I wanted a word to describe, 'A family dinner meant for family bonding but all the members of the family are glued to their mobile phones instead, and are gobbling down their food. No one is actually talking to one another face to face.'

'Technotalk' can be interpreted as 'talking to or talking via technology' or can also be interpreted as 'tech no talk'.

## MY WORD: NINJAUNT

By Mrs Goh Kaixin, Presbyterian High School

My word is a portmanteau of 'ninja' and 'jaunt'.

In today's internet, social media and online shopping age, the smartphone is like a teleportation device of the mind. It has the power to transport your thoughts and attention elsewhere even though you are physically present in a locality.

It would be nice to have a word that describes the act of students sneakily trying to pull off a smartphone teleportation during lessons while feigning attentiveness – thinking that the teacher didn't smell a rat.

This word may very well be used in the context of corporate meetings as well!

## MY WORD: HIPHONATED

By Mr Nicholas Perry, Hwa Chong Institution

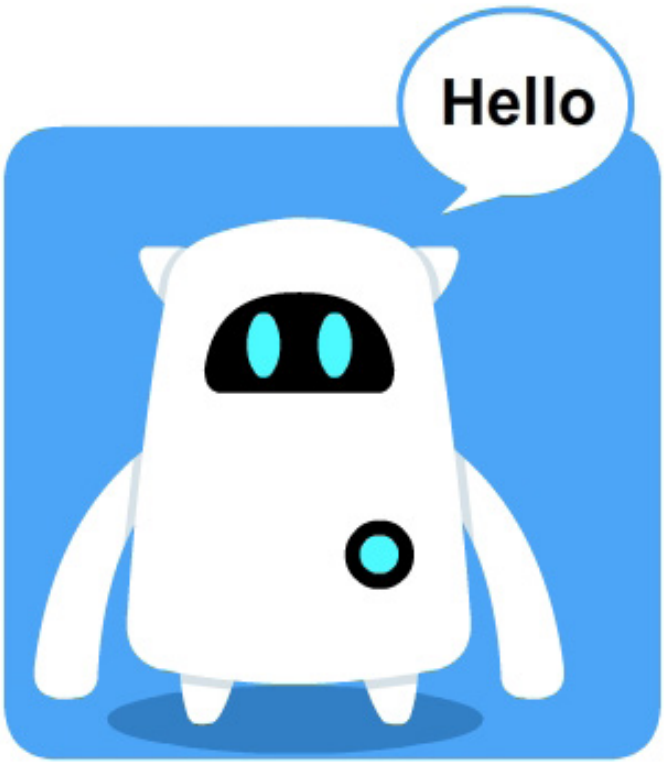
The word that I have come up with, for better or for worse, is 'hiphonated'. It defines the very current and highly pertinent issue of having one's attention divided or broken by being constantly distracted by one's handphone.

I came up with this word largely because I am of that generation which existed before handphones. In contrast to the handphone's addictive isolation on the MRT, conversations, books and newspapers were very much the order of the day then.

You would of course pronounce it as 'hyphenated' so that 'iPhone' comes out as clearly central to its construction. The play on 'hyphen' alludes to the divided nature of concentration that the user suffers when consumed by this ubiquitous device.

# SMART SCHOOLS

Artificial intelligence is changing education as we know it. Here's a look at how schools around the world are using AI and preparing their students for it.




## Talk Time

[Japan]

Fancy a chat? In Kyoto's Doshisha Elementary School, students practise their English language skills by talking to AI robots. Installed with millions of bytes of data taken from television series and English language learning materials, the robots can hold their own in a variety of conversations. They also score the students' pronunciation and conversation skills. Takashi Tanda, an English teacher at the school, said that the robots are like additional teachers. He added: "Usually the students are too shy to speak English in front of people, but their speech volume has increased tremendously since they started talking with the robots."

Source: Japan Forward, bit.ly/doshisha-elementary

## Stay In School

[India]

Keeping students in school is the bare minimum to ensuring that they get a good education. In Andhra Pradesh, the government teamed up with Microsoft to deploy an AI system to predict the probability that students will drop out of school. The system collates and analyses official data such as students' academic performance and socio-economic status, schools' physical infrastructure, and teachers' skill and experience to derive the probability for each student at the start of each school year. The schools are then alerted to the students who are likely to quit so that they can intervene before that happens.

Source: Microsoft, bit.ly/andhra-pradesh-ai

**MARKING MACHINES**

## 25 per cent

The percentage of schools in China that are using AI to mark students' work. This translates to about 60,000 schools.

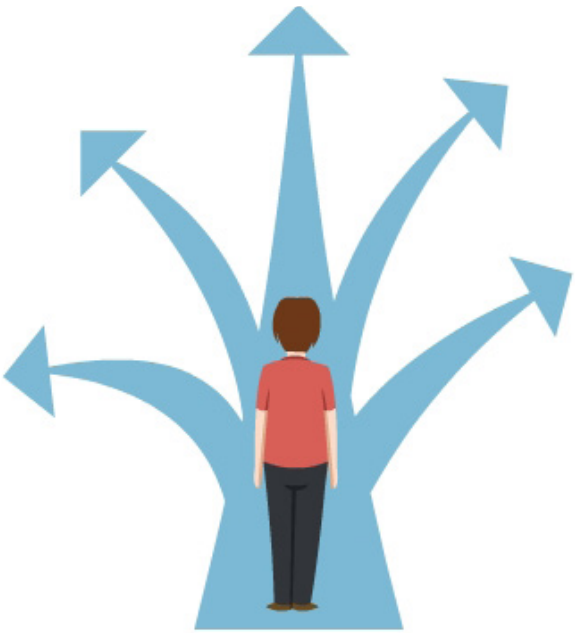
Source: South China Morning Post, bit.ly/ai-marking-machines

## Smart Guardian

[United States]

The Internet can be a Wild Wild West of dangerous and inappropriate content for school children. In California, the Redding School District installed an AI monitoring system on the electronic devices that it hands out to its students for online learning. The system not only blocks designated sites but also continuously scans content being accessed by each student. It uses machine learning algorithms to determine whether the content may be harmful, and if the student may be troubled and need help. When necessary, it sends cautionary messages to students and alerts to administrators.

Source: Ed Tech Magazine, bit.ly/redding-school-ai



## Making Your Own Way

[China]

Forging your own path is not just an ideal in the Beijing National Day School. It's a reality. The school has no head teachers and set classrooms, and an AI system creates personalised schedules for the students after they select from more than 400 classes. The system also grades their papers, while another AI teaching aid chatbot answers their questions. AI has also been integrated into 36 courses, from classical Chinese literature to biology, to familiarise the students with AI technologies and equipment. Principal Li Xigui said: "Schools must provide more opportunities for students to experience transformative technologies."

Source: China Daily, bit.ly/beijing-national-day-school

## Virtual Tutors

[Lebanon]

"Too many students, not enough teachers" is a sad reality in many places. In Lebanon, schools have been stretched to the breaking point with the influx of Syrian refugee children. Enter AI teaching programs. These smart online tutors teach students, administer tests to gauge their knowledge and progress, challenge stronger students with new material, and identify reasons students may be struggling with a topic. They also track every click and mouse movement to deduce where students may be uncertain, and calculate each student's rate of learning to decide when it should recap a particular topic to ensure that the student remembers it.

Source: Mohammed Bin Rashid Initiative For Global Prosperity, bit.ly/2T5dQDW

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**UNLEASHING AI**

# US$3.68 billion

The projected worth of the global AI in education market by 2023, up from just US$537 million in 2018, according to research firm MarketsandMarkets.

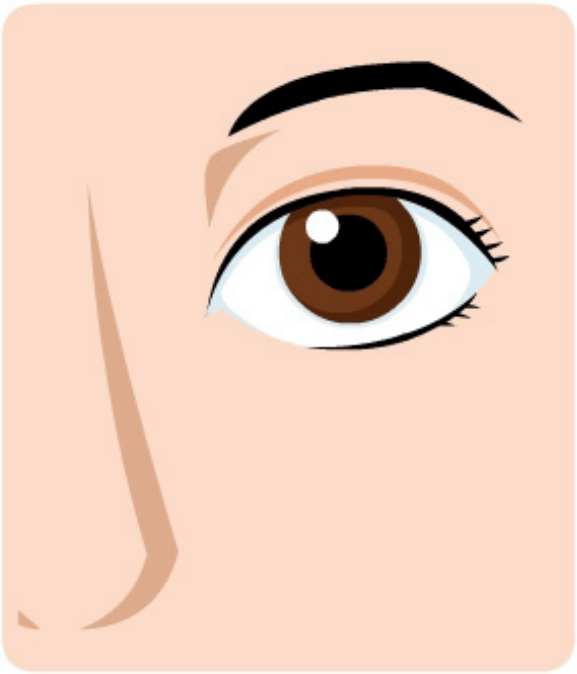
Source: MarketsandMarkets, bit.ly/ai-education-market

## Attention, Please

[France]

Online learning has expanded the universe of possibilities for students. But how can teachers ensure that they are actually paying attention, and not secretly playing computer games? The Paris School of Business may have the answer. The school is using students' webcams and AI software to analyse their eye movements and expressions during two online courses to determine if they are paying attention. The software also creates quizzes based on the content covered when the students' attention wandered, to get them to learn. Furthermore, it highlights such inattentiveness to the teachers so that they can improve their teaching.

Source: The Verge, bit.ly/2HZdw3k

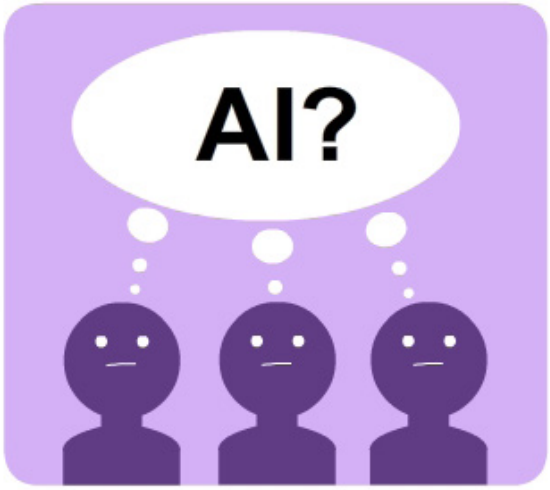


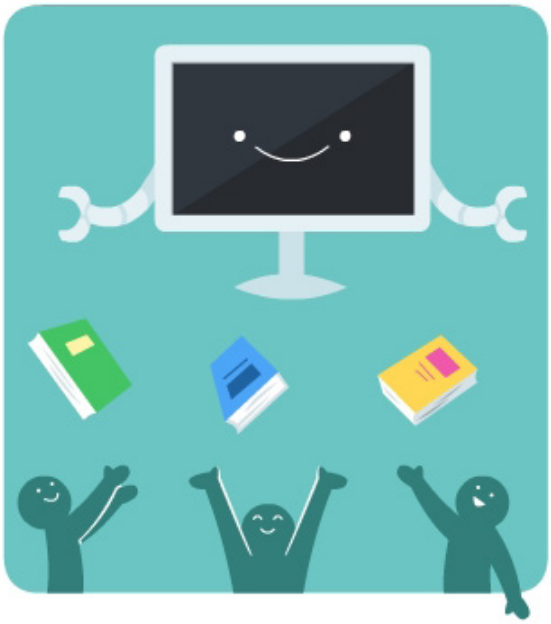
## Force For Good

[Australia]

Artificial intelligence will transform the world for future generations, so youngsters should have a say in its development. In Australia, high school students are taking part in an annual "AI For Good Challenge" organised by Microsoft to create AI uses that benefit the world. The participating students are taught the basics of AI in school and work in teams to brainstorm and flesh out ideas. In 2019, the winning ideas included an app that motivates children with Type 1 diabetes to manage their disease by gamifying the injection process, and an AI chatbot that provides pregnant women with crucial information.

Source: Microsoft, bit.ly/au-ai-for-good



## Education For All

"Artificial intelligence will be an altogether new way of spreading quality education across the world, especially to the hundreds of millions who do not have it. We have to embrace this revolution and ensure that we shape it to the best advantage of humanity."

*Sir Anthony Seldon, Vice-Chancellor of the University of Buckingham, during a lecture on how AI will change learning and teaching.*

Source: Heriot Watt University, bit.ly/anthony-seldon

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### IS IT ALL ABOUT MACHINE LEARNING?

"Many jobs will still be done by people. Their capacity will be greatly extended by intelligent machines."

Mr Marc Tucker, founder of US think tank National Center for Education and the Economy

Source: Schoolbag.sg, bit.ly/marc-tucker

# Advance at your own pace

More personalised learning with the use of
Adaptive Learning enhanced by Artificial Intelligence!

Every teacher has experienced this in class at some point: some students grasping a topic quickly and ready to move on whilst others are struggling with previous topics and finding it difficult to progress.

What if there was a way to help all students progress at their own pace?

Imagine a computer program that supports students in learning concepts, assesses their performance in real time, and adjusts their learning pathways based on their individual knowledge level.

Two schools, **Catholic High School** and **Presbyterian High School**, recently trialled adaptive learning systems during some of their mathematics classes.

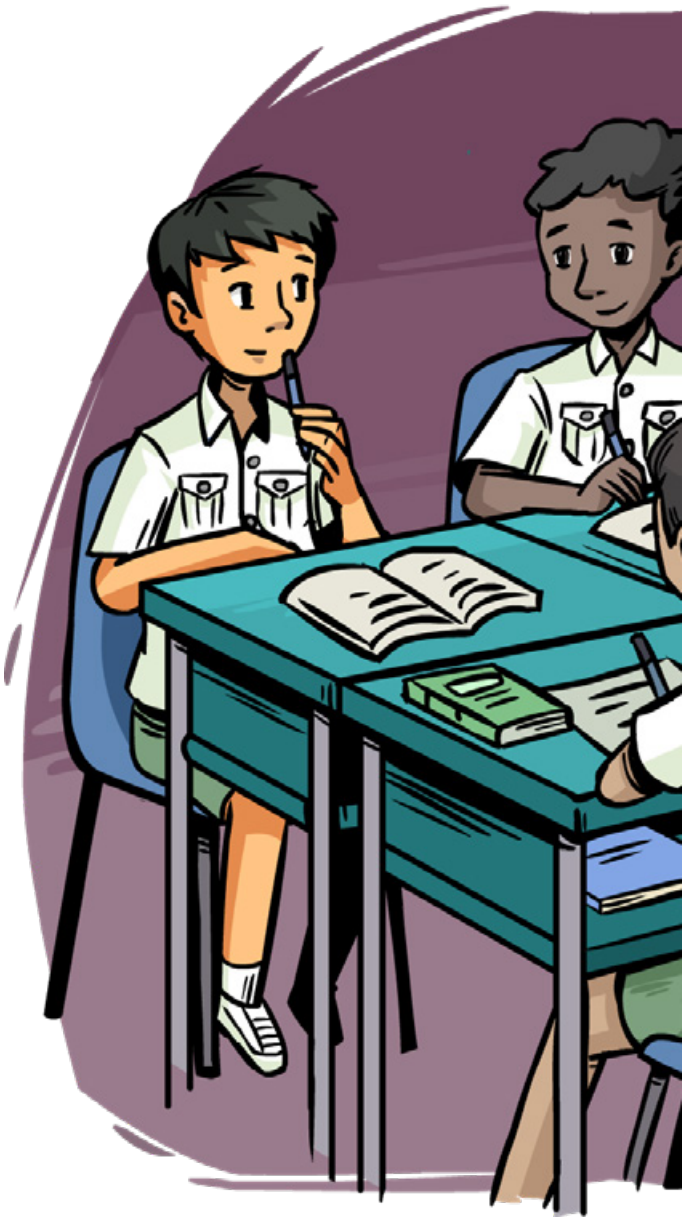
## RETHINKING HOMEWORK AND CLASS TIME

When **Mrs Debbie Chow**, **Catholic High School**'s Year Head for Lower Levels, used an adaptive learning programme for some of her mathematics classes, she knew which of her students had mastered a particular topic, and who needed help, even before she entered the classroom.

Before each class, the students completed a series of modules on a topic, and Mrs Chow received learning reports on each student's performance.

"Instead of teaching the topic in class, I could get the students to ask questions, clear the misconceptions that were surfaced through their work, bring in more performance tasks, and talk more

"WHEN YOU DO THE SAME THINGS YEAR AFTER YEAR, YOU MIGHT START TO MAKE ASSUMPTIONS ABOUT WHAT STUDENTS CAN FOLLOW... ADAPTIVE LEARNING SYSTEMS COULD POINT OUT WHERE YOU MIGHT NEED TO CHANGE AND IMPROVE IN YOUR TEACHING."



about real-world contexts where the mathematics is applied," she says.

**Madam Koh Puey Leng**, another Catholic High School teacher who took part in the adaptive learning trial, adds: "The students asked better questions because they were prepared."

For each topic, the teachers also used mixed groups in which students were progressing at different rates, as identified by the adaptive learning program. This encouraged peer teaching and learning, and also allowed the teachers to focus attention on students who were struggling the most.

The difference in the classroom was palpable. "The adaptive learning program has stages and is like a game to the students. They can see themselves progressing and are motivated to do better, to hit the next achievement level," says Mrs Chow.

Adaptive learning stirred both the students' competitiveness and compassion, with students eager to outdo one another but also encouraging and lending a hand to their classmates.

Mrs Chow says, "We gave some of the boys drawstring bags to mark their efforts and successes. One of them gave away his bag to a classmate as a form of encouragement. It was a beautiful surprise to see this softer side of the boys."

## A BOOST FOR STUDENTS AND TEACHERS

At **Presbyterian High School**, adaptive learning boosted students' confidence when it was used during some mathematics remedial sessions.

Some students preferred working on their own, at their own pace. "When they got something wrong, they read the explanation and tried again. When they got it right, they felt a sense of achievement," says **Mr Alvin Toh**, a Presbyterian High School mathematics teacher.

"I had a student who didn't pay attention in class. But when he used the adaptive learning program, he became more interested in maths and would even work on problems when he got home. The element of self-direction motivated him to do well," he explains.

As with Catholic High, students who excelled in a topic were asked to assist their classmates. This gave the chosen ones a sense of responsibility and signalled to the class that even if they were weak in some parts of mathematics, they could be good at others.

Mr Toh adds that teachers could learn a thing or two about their professional "blindspots" from adaptive learning programs.

"When you do the same things year after year, you might start to make assumptions about what students can follow. By flagging where students are having trouble, adaptive learning systems could point out where you might need to change and improve in your teaching," he says.

## ADAPTING ADAPTIVE LEARNING

Still, there are limitations to existing adaptive learning systems.

Teachers from both Catholic High School and Presbyterian High

School note that most of the mathematics programs do not have the option for students to enter their workings.

Localised examples, with measurements in centimetres and metres instead of feet and inches, and questions drawn from real-life examples, such as fare computation when taking the MRT train would also be more interesting for students.

"Adaptive learning systems process a large amount of data, but the information presented to the teachers has to be simplified so that they can use it effectively to understand students' learning progression, and plan appropriate learning activities for their students," says **Ms Jean Phua**, a Lead Specialist in the Ministry of Education's Technologies for Learning Branch, Educational Technology Division. "As we build up our knowledge on how adaptive learning systems function and learn to extract meaningful data for teachers, we'll be able to create a system that meets the needs of our teachers and students."


Teck Whye Primary School

# TOTAL DEFENCE IN ACTION

As the virus hits our tiny nation, Total Defence is more relevant than ever. See how our schools and students have risen to the challenge of keeping Singapore safe and strong.

BY **MS GOH HONG YI** / SECONDARY SCHOOL HISTORY TEACHER

As a student, and later a teacher, I have participated in the commemoration of Total Defence Day many times.

Each year, we discuss the threats faced by Singapore. The Fall of Singapore and the Japanese Occupation were, naturally, recurring topics. During recess, students would usually exchange "ration coupons" for war-time food like plain porridge and sweet potatoes. Through these activities, students get a sense (just the briefest glimpse!) of the hardships our forefathers went through when Singapore failed to defend itself.

The idea of Total Defence has never been so real as it is this year though.

The outbreak of the Corona Virus Disease (COVID-19) reminds us that threats go beyond war. Unlike previous crises, the adversary we are facing today is not so obvious – we cannot see the virus!

"THE OUTBREAK OF THE CORONA VIRUS DISEASE (COVID-19) REMINDS US THAT THREATS GO BEYOND WAR."

The effects of fear, however, are very visible to our students. Temperature screenings are now a daily routine in schools. People are wearing masks on public transport. The malls are palpably emptier. Every day, the news discusses each new case at length, and their classmates and teachers may go on leave of absence.

Here is where Total Defence comes in. More effective than any class activity, our students are witnessing acts of courage and selflessness taking place all around them. From our healthcare professionals at the frontline to the volunteers distributing masks and delivering food to those quarantined, to the teachers and cleaning staff in our schools, Singapore is rallying together through civil and social defence to fight the virus. On the economic front, relief measures are underway to help affected businesses and workers.

In schools, teachers are going all out to help with precautionary measures such as visual screening and temperature taking. They are also busy preparing Home-based Learning packages for those who are on leave of absence, and designing lessons to teach students more


**Maha Bodhi School:** Psychological defence – encouraging each other in difficult times.

**Blangah Rise Primary School:** Bus operators are disinfecting their buses more frequently to keep our students safe.

**Teck Whye Primary School:** Temperature-taking helps us detect those who are unwell!

about the virus. Our support staff are also stepping up cleaning and disinfecting processes to keep schools safe for students. In the face of a threat like the virus, everyone is playing a part.

As schools commemorated Total Defence Day on 14 February, students were rallied to fight the virus and keep themselves healthy. In class, they are learning from the "Soaper 5", a new cast of superheroes, who advocate for good hygiene practices and social responsibility amidst the spread of the virus.

Students are also putting what they learnt into practice. Regular handwashing and wiping down their tables after meals are simple acts that help stop the virus from spreading. Students are also penning notes to frontline workers to encourage them, and coming up with videos and slogans to spread positivity. At a time when nurses and healthcare workers are being treated with suspicion by some members of the public, these tokens of appreciation go a long way. There have also been individual acts of kindness – like a P6 student from Teck Whye Primary, who bought his friend a thermometer with his savings because his friend would forget to bring his to school. Way to go, students!

For many of our students, this is the first national crisis they are experiencing. There are many unknowns about the virus, and no one knows for sure how many people will be infected and how long it will be before it dies down.

One thing is certain though - this is not the last crisis Singapore will have to face and the lessons of Total Defence this year will still be relevant in the future. Hopefully, when our children look back on this episode years from now, they will remember not so much the fear, but the shining moments of kindness, dedication and goodwill shown by so many Singaporeans.

"Together we keep Singapore strong" is more than just a slogan. It is what they lived through and what will give them the confidence to face any challenge the future brings.

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The writer has taught History in a local secondary school for 7 years, and is now posted to MOE HQ.


The Soaper 5 are here to fight the virus!

1

# INSIDER'S LOOK AT SCHOOL LIFE

## Let these photos from our school staff feed your curiosity, stir your imagination and spark joy.

**When 'Our Schools, Our Stories' (OSOS) was launched in 2018, we set out to capture the joy and buzz that students and teachers witness each day in schools. And what better way to do it than capturing the magic through their lenses.**

**At the close of 2019's photo contest for OSOS, we had received close to 1,000 entries from 151 schools. This works out to around 7,000 photos!**

**Here is a selection of images from three entries from school staff, to inspire you ahead of the OSOS photo contest 2020.**

2

1, 2, 3, 4 & 5

BY **CHRISTINA WONG**
JING SHAN PRIMARY SCHOOL

Theme
MANY DIFFERENT FORMS OF LEARNING

Gone are the days when learning was confined to a classroom setting. Each child's pace of development varies, and only through the exposure to different forms of learning, can they truly discover their potential. Education is not all about pen-and-paper learning, but also includes the experience of discovering something new.

3

4

5

6, 7, 8 & 9

BY **JACOB TAN**
COMMONWEALTH SECONDARY

Theme
TEACHING WITH SWEAT AND BLOOD

I often bring my Biology students on a Learning Journey to the Bloodbank. I want them to see the application of the knowledge in a national agency, and also inspire them to become donors in the future.

Last year, I found a dead male black bittern on the grass patch near the carpark. I gathered some colleagues and students to study it.

6


7


8

It was rare for this bird to appear in our urban environment. The male black bittern has black upperparts, a whitish throat, a whitish breast with dense dark streaks, and a yellow neck-patch. It's status in Singapore is an 'Uncommon Migrant', and is most likely part of the northern population that is spending the winter in Southeast Asia. The cause of death is inconclusive. There weren't any obvious sign of wounds, and the carcass was found at a distance away from the building. It could have died from exhaustion, or from colliding with another bird.

9

11

12

13

10, 11, 12, 13 & 14

BY **MARCUS LOW**
QUEENSWAY SECONDARY SCHOOL

Theme
**CULMINATION OF EFFORT**

From the facing of our fears and overcoming them, to the fleeting moments of scoring a goal; from marching to the front of the school to the ten seconds on the track, and possibly winning the race; from going through camps and building bonds to interacting with different cultures – all these moments are what we will remember forever

**Visit www.moe.gov.sg/schoolstories to learn more about the exhibition or photo contest.**


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# SCHOOLS OF THE FUTURE

Changing times call for changing education systems. Here's a look at how schools are adapting to trends and making use of technologies.


## In Your Own Time

[Germany]

No grades, no timetable, no problem. At the Evangelical School Berlin Centre, students take charge of their education, and there are no grades until they turn 15 years old. They decide what they want to study for each lesson, selecting from units in mathematics, social studies, German, English and other courses. They also design their own projects, set their own learning goals with teachers' help, and choose when they want to take examinations, which can be in unconventional forms, such as practical tests instead of paper ones. The school's headteacher Margret Rasfeld explained: 'Nothing motivates students more than when they discover the meaning behind a subject of their own accord."

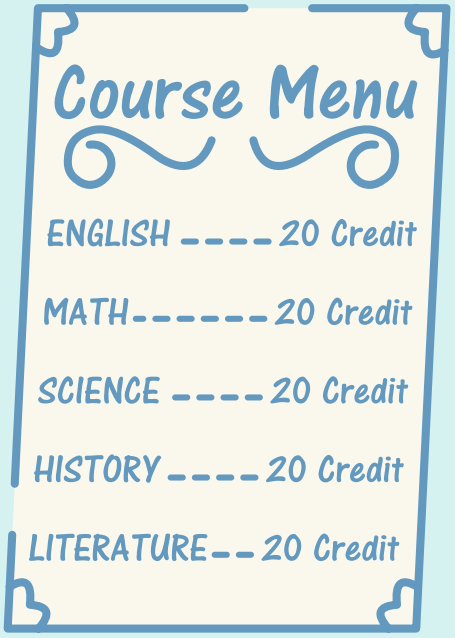
Source: The Guardian, bit.ly/e-s-b-c

## A Creditworthy System

[South Korea]

Personalised education is on the rise in South Korea. Currently, some students in 354 high schools can choose from a buffet of courses to earn credits towards graduation, just like in universities. This credit-based system will be expanded to all of the country's high schools in 2025, and the variety of classes will be expanded to include more diverse subjects, such as vocational training. The Ministry of Education said that the change will enable students to focus on their aptitudes and passions: "We want to shift away from 'one-size-fits-all' high school education toward supporting students' diverse career pathways."

Source: The Straits Times, bit.ly/s-korea-high-schools

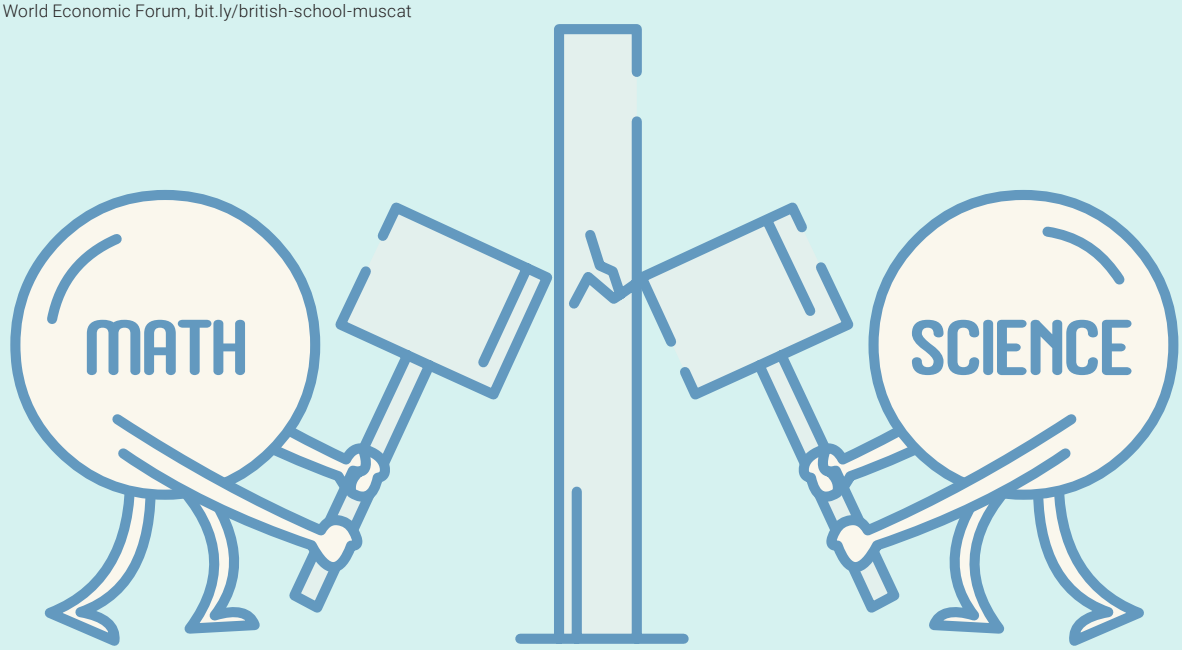


## Breaking Down Barriers

[Oman]

Silos are out, integration is in. At the British School Muscat, students absorb lessons through collaborative, interdisciplinary projects, rather than in traditional subject-based classes. For a module on single-use plastics, for instance, they write essays to persuade others not to use them, present their arguments, calculate how much plastic the school would save if each student refused one plastic bag, and design alternatives to the bags. The module combines concepts in science, mathematics, English and public speaking, and encourages the students to think about the interlinkages behind complex problems in real life. The hands-on work also hones their applications of lessons.

Source: World Economic Forum, bit.ly/british-school-muscat




### BRING YOUR OWN DEVICE

**66 per cent**

The proportion of secondary schools in Ontario, Canada, that encourage students to bring their electronic devices to class every day. Teachers in these schools plan lessons with the devices in mind.

Source: People For Education, bit.ly/ontario-schools

### EVOLVING EDUCATION

"Our education system today is in its most diverse form. And it will become even more diverse, as each school differentiates itself through the convictions, beliefs and innovation of their leaders."

*Minister for Education Ong Ye Kung, in his address at the Appointment and Appreciation Ceremony for Principals.*

## Driving Digitisation

[Britain]

With digital technologies transforming industries, training students to be conversant in them is key to preparing them for the rest of their lives. The Sevenoaks School in Kent uses iPads and subject-specific software for classes, posts homework and learning materials online, and brings some lessons to life through virtual reality technologies. It also teaches students essential digital skills, including programming and how to conduct online research, and helps them to develop online profiles showcasing their talents and skills. These can be used for their higher education and job applications.

Source: Sevenoaks School, bit.ly/sevenoaks-school

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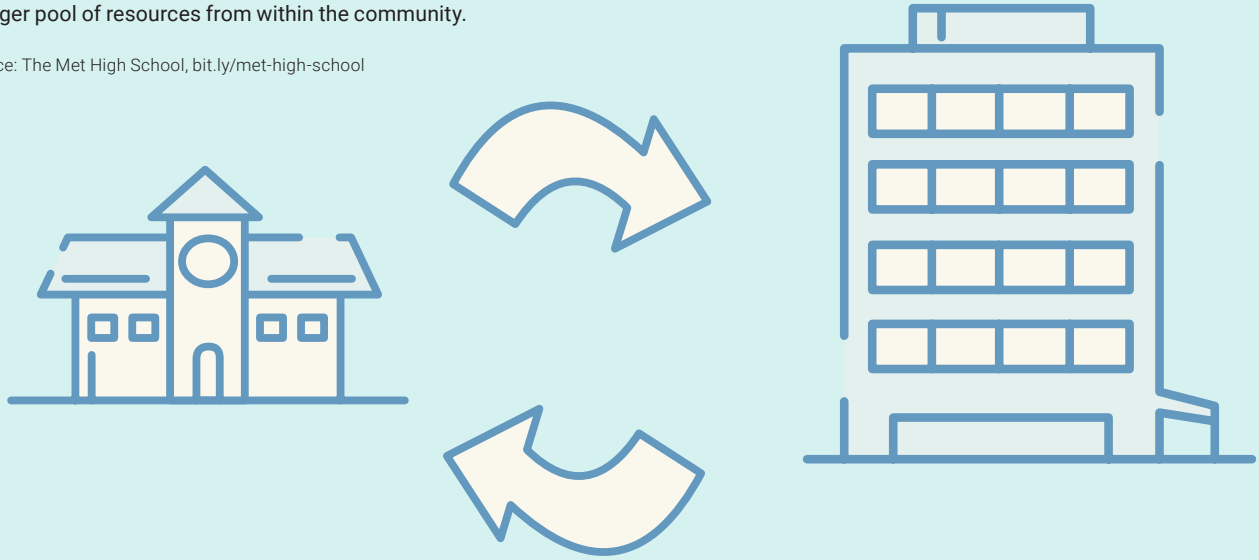
## Going Beyond Schools

[United States]

For students at the Met High School in Rhode Island, the community is their classroom. Guided by teachers, they identify their interests, choose mentors from partnering businesses and organisations, and then spend two days each week for the rest of the school year at their mentors' workplaces. They also develop long-term projects to work on with their mentors and school advisors. With such immersive experiences, the students get real skills training in real working environments, and have the opportunity to develop relationships with experts in their chosen fields. The school can also draw on a larger pool of resources from within the community.

Source: The Met High School, bit.ly/met-high-school



## Open Minds, Open Schools

[Finland]

Walls are coming down in Finland's schools, both literally and figuratively. As the country embraces multidisciplinary learning, schools are becoming more open-plan. To give students adaptable areas for projects, experiments, discussions and lessons, the Kastelli School in Oulu has expansive spaces with moveable walls instead of permanent classrooms. Its long and wide walkways and comfortable gathering spaces also encourage students to have conversations about their work. Mr Reino Tapaninen, Chief Architect at the National Agency for Education, said of the plan to redesign Finland's schools: "We've given up the old 'school desk and chair', and have a real diversity now."

Source: World Economic Forum, bit.ly/kastelli-school

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## Learn As You Like

[Brazil]

Some students learn better visually while others prefer textbooks. At the Colégio Soter school in São Paulo, there's room for all learning styles. To complete a module on the life cycle of insects, for example, students can create a diagram using arts and crafts materials, play a game on a tablet, or fill in worksheets after watching a YouTube video or reading a story. During the blended learning classes, teachers explain the activities and answer any questions students may have about the material. This forward-looking approach gives students more autonomy over and variety in their learning, and empowers teachers to accommodate many skills and competencies in one class period.

Source: The Christensen Institute, bit.ly/colegio-soter


# LONG-RANGE THINKING

Is Singapore ready for the future? We ask Professor Lim Siong Guan. Here is his unvarnished advice on thriving in a world of change and complexity.

Professor Lim Siong Guan is one of the pre-eminent pioneers of Singapore. He spent 37 years in public service – five years as head of the civil service.

In his 2014 book, *The Leader, The Teacher & You*, Mr Lim gave an insight into his years as permanent secretary at MOE, where he introduced the President's Award for Teachers, and the "Thinking Schools, Learning Nation" movement, besides other initiatives.

One of his enduring efforts is to build up the standing and professional pride of Singapore educators.

We sat down with him at his office in the Lee Kuan Yew School of Public Policy, where he is Professor in Practice focusing on leadership and change management, to discuss professional development and to answer the perennial question, are we ready for the future?

***Contact:* What prompted the concerted effort in the 1990s to look into professional development for teachers?**

**Prof Lim Siong Guan**: I came in with one philosophy, which is, effective education is fundamentally about the teacher. The teacher is the one who needs maximum encouragement and support. What our schools can deliver depends on the teachers, with the guidance and direct leadership of the principal, as they are in the best position to know the capacity of their students and the capability of their teachers, and what they can expect to achieve in what timeframe.

It's not a matter of the reflection of the situation in the 1990s. It's a matter of addressing the perennial questions, What more can we do? How can we give more support to schools? How can we raise the standing of the teachers? What can we do to help each child be the best he or she can be, according to their talents and abilities?

> "EFFECTIVE EDUCATION IS FUNDAMENTALLY ABOUT THE TEACHER. THE TEACHER IS THE ONE WHO NEEDS MAXIMUM ENCOURAGEMENT AND SUPPORT."

***Contact:* How do you ensure that teachers thrive?**

**Prof Lim:** I've always believed that the leader is there to help their people get the job done as best as they can, and do everything they can to make it possible. When I was Perm Sec, I had a rule for senior MOE management to visit at least one school each week. There were 14 of us. After deducting the weeks for school exams and school holidays, it meant we visited every school at least once each year. The purpose was to offer encouragement and improve communication with MOE HQ, but, most particularly, to see what we could do to help them do their job better.

***Contact:* Considering the rate at which technology is developing, how do you know if everyone is moving forward?**

**Prof Lim:** When you have so many schools to deal with, the most important thing is to agree on that one thing we all are trying to achieve. If I stop any teacher or principal, and ask 'What are you trying to do?', I hope very much that they will immediately tell me what they want to do is help every child be the best he or she can be according to his or her talents and abilities.

If technology is the big thing that everybody needs to understand, then we get it across to all principals, teachers and students in school. If we say, in this evolving future, there are qualities, characteristics and values we need to get across, then we work that through. But remember, every one of these things must be part of the whole effort to help every child be the best he or she can be.

***Contact:* Then, professional development is a good way to organise all these efforts, so teachers can equip themselves.**

**Prof Lim:** That's provided what you do in professional development is to equip teachers well to prepare their students not for the past, not for the present, but for the future needs of the young people

when they enter the workforce. Education is, at *minimum*, a 20-year preparation, from Nursery 1 to graduating from university. It requires conviction about what *their* future needs, and in particular requires clarity about the needs of the future rather than what we can see at present.

I think the starting point in professional development should be to ask ourselves, how would you describe a Singapore, which is successful, 30 years from now?

30 years from now is the generation of the children of the students now in school. 30 years from now is the generation of the grandchildren of your teachers. You can turn around and say, that's quite ridiculous. How can I say what schools need to deliver which will be good for Singapore 30 years from now? But I assure you, if you take the effort to do that – when teachers can answer the question for themselves – everybody will be clear what they have to be doing now to assure a sustainably successful Singapore in SG100.

For example, if you say, 30 years from now, a highly successful Singapore will be one that is a gracious society, where people look out for each other and demonstrate care and concern for others, teachers will know immediately what they have to start doing now. Thus, for example, when I asked my Japanese friends whether there are 'elite schools' in Japan, they told me that there are, and that these schools have a particular focus on values because the students are already very capable in academics.

If you say, I believe a thriving Singapore will require our students to be innovative, creative and entrepreneurial, then what are you doing about getting them there? If you believe you need your students to be innovative, creative and entrepreneurial, the question you must then ask is, 'When you think of innovation, what percentage success do you think the efforts on innovation need to have?'

Think about it. If we say, 50 per cent success rate, some people will say that's not very innovative. If we're truly original and innovative, we need all kinds of crazy ideas because only then do we begin to discover the good stuff. So perhaps it will be 10 percent of ideas succeeding.

Whichever the case, even if I grant you five out of 10 ideas succeeding, do you know what that means? It means of every 10 efforts I make, five will fail. Tell me, what are we doing to show students that failing is not only OK, but also a great idea? We need to prepare them to be comfortable with only 1 out of 10 efforts succeeding. Today, we tend to push ourselves to zero failure rather than to cope with 90% failure rate.

***Contact:* What is a good way to go about achieving this?**

**Prof Lim:** I have a friend in Israel who is retired. I asked him what he is doing these days. He said he is going around schools to set up robotics clubs. Singaporeans may be inclined to pat themselves on their back and say that's nothing new, more than 250 schools in Singapore have robotics clubs.

So I asked him, what do you do when you set up a robotics club? He said, the first thing he did was to teach the students social responsibility. They need to be able to answer the question, in what way is the robot you're trying to build useful and beneficial to society? Or, at least, they must be clear in their minds that it will not be irresponsible with respect to society.

And after that? He said, we run a programme to teach the students how to cope with failure. All these before they build robots. I asked, why? He said, the students who join robotics clubs want to take part in international robotics competitions. How many winners can there be? The chances of not being a winner is terribly high. So, we teach them how to cope with failure. That's remarkable!

Are we teaching our students how to cope with failure? Are we teaching our students the issue is not Gold medals and A grades, but imagining and trying and learning and tenacity and putting in the best effort? Are our teachers equipped to be live examples for creating such a culture of learning by doing and succeeding through failure?

> "THE FUTURE WE'RE HAVING TO TRAIN OUR CHILDREN FOR, IS A FUTURE WE CANNOT DEFINE. THAT PUTS A DIFFERENT PROPOSITION AND A DIFFERENT CHALLENGE FOR THE SYSTEM."

***Contact:* It's no longer just teaching the subject, it's teaching the subject in context of society.**

**Prof Lim:** The one thing that I learnt in my time at Ministry of Education is, there are certain things which are caught and not taught. Things like values and attitudes, where teachers are the exemplars. It means we have to bring the teachers themselves through such an experience. Otherwise they wouldn't know what they are talking about.

I know this is a tough proposition. But that's the business of education. It's to create the possibilities of success. The tough thing is how to enhance the possibilities of success for a world where you cannot be certain what it would look like. It is about creating our future, not about reacting to a future. If our approach is that of responsiveness, we need to know what the future would be like. If we are creating the future, we need only to be clear what are the life attitudes and qualities of mind our young people need to build up in their school years to be in time for their future.

You're talking about lifelong learning and so forth. You're talking therefore about a world that keeps evolving, a world which we need to have the humility to accept that we cannot define. It is not a world in which most parents today have found their success. So the parents are not in a good position to guide their children to future success. That responsibility lies with our teachers, to prepare their students for success in a world the teachers themselves have never experienced.

It seems to me we haven't started thinking about how to succeed with the unknown. In our minds, we kind of say, if you define for us the future, we will know what to teach our children. The problem is that things are changing so fast that we cannot define the future. We need to convince ourselves that the future we're having to train our children for, is a future we cannot define. That puts a different proposition and a different challenge for the system.

# INSPIRING CHANGE

## Retired principal Mr Tan Chor Pang shares his insights on energising teachers and students to look ahead in order to better seize future opportunities.

Given the increasing pace and complexity of social and cultural change, schools need to anticipate how forces outside their walls are shaping the status quo – or perhaps are creating conditions for new ways to learn and grow.

Among those advocating for that view is recently retired Principal, Mr Tan Chor Pang.

"The workplace must be a driver for learning," he says. "You learn because you see a future in the workplace."

Years ago, Mr Tan realised that the different demands of the 21st century school warranted a new model of leadership. His first posting as Principal was at **Pioneer Secondary**, from 1995 to 2005.

"I wondered how to get the school thinking about being future-ready," he says. "Students will end up in the future, going into different industries. The school cannot just prepare them for the present; it must prepare them for the future. But how do I do it?"

The question isn't rhetorical. That was the challenge for which Mr Tan set out to find solutions.

### CONNECT THE WORLDS OF LEARNING AND WORK

At Pioneer Secondary, he championed the idea of industry attachments for students. He says, "Students must be able to observe and learn the requirements and expectations in the workplace.

"We were the early pioneers in doing this," he continues. "I did cold calls, wrote to companies in the nearby Jurong area, and asked if they would come on board. Some responded, many didn't. We had to hunt, meet people, and talk it through."

It worked. "At its peak," says Mr Tan, "the school was working with five to six partners who would host students every year."

In the decade he served at Pioneer Secondary, Mr Tan began to define leadership largely as a matter of tapping into the collective intelligence of those around him.


"There are no two ways about it," he says. "There will always be people who share your vision, but you have to know your colleagues. You have to know who is game for challenges. If they are willing, it's easy. If they are willing and have the skill sets, even easier.

"Most of the time, people are willing but don't know how to move forward. This is when we work together, think through our plans and talk to other people. There are many things I had to learn by picking people's minds."

## RECOGNISING THE IT SHIFT

When Mr Tan started teaching Mathematics and Physical Education in 1984, it was a different world. Personal computers were in their teething stages, the Macintosh was born, and few had heard of the Internet.

In under a decade, the World Wide Web became the primary tool that people used to interact across the globe. It became common for companies to have an Information Technology (IT) department.

"When I was vice-principal at **Commonwealth Secondary**, it was the beginning of the IT phase," he says. "It was the first time the school had computers. Instead of giving out notes, we could save it digitally and put lesson materials online with simple web programmes."

Hypertext Markup Language, or HTML was the talk of town. "It was the future of learning then," he continues. "With the little that I learnt, I encouraged as many people as possible to try it.

"It was not difficult to learn simple coding. It was like typing a document, except you save it as an HTML code. By trying, we explored things we could not do in the past, like inserting more pictures into our notes, changing and improving the presentations easily and making hyperlinks."

In the years that followed, Mr Tan harnessed technology to bring the world to his students.

In 2001, Pioneer Secondary was invited to join an international network of schools initiated by the Asia-Europe Foundation (ASEF). Every year, teachers and students from schools across Asia and Europe get connected , and spend three to six months

collaborating on projects via ICT. The Asia-Europe Classroom Network (now renamed as ASEF CLassNet) will then shortlist outstanding projects, and invite teachers and students to present – in person – at an annual conference.

Up to this point, Pioneer Secondary had been building its own e-learning platform. Recognising their efforts, MOE's Educational Technology Division invited the school to attend the 1st AEC conference in Singapore.

"The world is becoming flatter, more connected, and there's a need for greater intercultural understanding. I saw a great amount of opportunity with what ASEF was trying to promote."

After Pioneer Sec, Mr Tan continued his alliance with ASEF ClassNet by bringing the project into Millennia Institute (MI) when he took over as its second Principal in Dec 2005. Pioneer Secondary continued to run the programme, and brought it to Boon Lay Secondary when both schools merged in 2017.

These schools put Singapore on the world map, having distinguished themselves as repeat winners of ASEF ClassNet Awards over the years.

## CREATE A SENSE OF SHARED MISSION

If social and technological trends are bringing a breath-taking degree of complexity and change, so too has a Principal's duties grown in scope and difficulty.

In 2006, Mr Tan faced his biggest challenge yet. Jurong Institute and Outram Institute, both three-year pre-universities, had merged in 2005 to form **Millennia Institute**. As Principal of the new school, he had the unenviable job of overseeing the final transition: the completion of the new building and relocation to a permanent campus.

"Those days were challenging," he says. "I had to shuttle between three places, and manage two different cultures and people. My capacities were stretched. At one point, I wondered if I really had what it took to do the job well.

"The biggest challenge was when the two entities physically came together," he continues. "I worked to address a lot of issues, mitigate the tensions."

Mr Tan strived to create a sense of shared mission among teachers and students. "If there's a word to describe MI, it is 'purpose'," he says. "People must be purposeful in their pursuit."

"I often tell students that they are like aeroplanes. They may not fly as fast as superman, or as natural as a bird. However, I remind every batch that they are made to fly. To do that, they must be prepared to get onto the runway. It's okay if they need more time or a longer runway to pick up speed, our teachers are here to help."

One of the initiatives in MI that Mr Tan built up was the dual-track scheme. It gave students the choice to work towards getting both the A-levels and a diploma in their three years there.

"It was a selling point that draws students into MI and work purposefully towards their career goals," he says. "I'm glad I pressed on."

## FORMING THE CCA IDENTITY

In April 2016, Mr Tan stood at the helm of a second school merger. Boon Lay Secondary would merge with Pioneer Secondary the coming year. He was to become Principal of the new **Boon Lay Secondary**.

This time, Mr Tan says, "I've become wiser." He could not settle for business as usual. It was important to give teachers and students a new north star.

In the months leading up to the merger, he made many small observations in Boon Lay Secondary that exposed undiscovered cultural meaning – and dormant strategic value.

"I was standing outside the general office one day," he explains, "watching a group of boys from the cross-country CCA doing their training. The student leader was leading the boys, and he made them run 10 rounds around the school. I observed that everybody just ran – no protest. I imagined to myself that if the teacher in charge of the CCA would do the same, surely the instructions would be met with all sorts of negotiating, bargaining and even refusal.

"I mulled over a few key questions: How can

positive behaviours in CCA like self-discipline be carried into the classroom? How can I make student influence a positive driving force in the school?"

The answer was in capitalising the value students placed in their CCA identity. "A student's identity in school is quite complex," says Mr Tan. "They are confronted with many competing identities. There's a CCA identity, a form class identity, a house identity, and a stream identity. They change their behaviours according to the context. The CCA identity was the best in terms of self-discipline."

To make sure like-minded and ready teachers get on board, Mr Tan says the teachers who chose to stay with the merger must be open to this novel concept which requires a cultural shift. Mr Tan suggested the concept of a CCA-centric school. Instead of form classes, students are organised in their CCAs every morning before they disperse to their respective subject classes. "The CCA becomes the basic family unit," he says, "and the school is the extended family. We will place less emphasis on exams and focus on helping students pursue their aspirations, and changing their habits for success."

For students who do not know their aspirations, Mr Tan says, "We will help them discover what they are strong in. Then, I'm sure they will get to somewhere they will be happy about."

> "HOW CAN I MAKE STUDENT INFLUENCE A POSITIVE DRIVING FORCE IN THE SCHOOL? THE ANSWER WAS IN CAPITALISING THE VALUE STUDENTS PLACED IN THEIR CCA IDENTITY."

## BUILDING UP STUDENTS' PORTFOLIOS

In 2017, Boon Lay Secondary introduced the Student Development (SD) Module Programme. It offers students modular courses in six categories: Digital and Infotech, Relations and Business, Engineering, Science and Maths, Arts and Humanities, Media and Design, Sports and Leisure. (The first letter of each category combines to spell, DREAMS.)

The premise is simple. For term 1,2 & 3 , students in secondary 1-3 with an interest in, say journalism can sign up for the 8-hour modules. Students capture their pursuits in a personal portfolio. As they build up their portfolio, their areas of strengths, interests and aspirations gradually become apparent.

Three years on, and teachers are starting to see positive effects. Mr Tan says, "We're slowly getting there. One measure is to check in with students' families. We know we have made a difference when students are purposeful and behave well even when teachers aren't looking. That's consistency of behaviour, and because of that, their character will be formed, and values will be right."

"Once we tackle the non-cognitive factors, we can engage the students in class. Today, our teachers say that they can teach better. Students are listening. Will we get results? Of course, we will."

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Mr Tan Chor Pang started teaching Mathematics and Physical Education in 1984. Then, he spent two years in MOE HQ in school planning, working with architects and land planners to build schools and upgrade existing ones. After five years as Deyi Secondary's Mathematics Head of Department, he rose to vice-principal of Commonwealth Secondary, and later Zhonghua Secondary. In 1995, he was appointed Principal of Pioneer Secondary, and then Principal of Millennia Institute in 2006. From 2016, he served as Principal of Boon Lay Secondary until he officially retired on 4 Jan 2020. From 13 Jan 2020, he embarked on a new career as Deputy Chief Executive of At-Sunrice GlobalChef Academy as he continues to model the way for students.

## MAKE CULTURE BUILDING A PRIORITY

Over the years, one guiding principle remained true: creating a culture of learning must be a priority.

"In my early days as a teacher, I spent a lot of time trying to hook students into learning math," Mr Tan says, "I try to show math in everyday life, and make things practical for them."

When Mr Tan became Head of Department for Mathematics at **Deyi Secondary**, he focused on getting teachers to "create experiences rather than just deliver lessons".

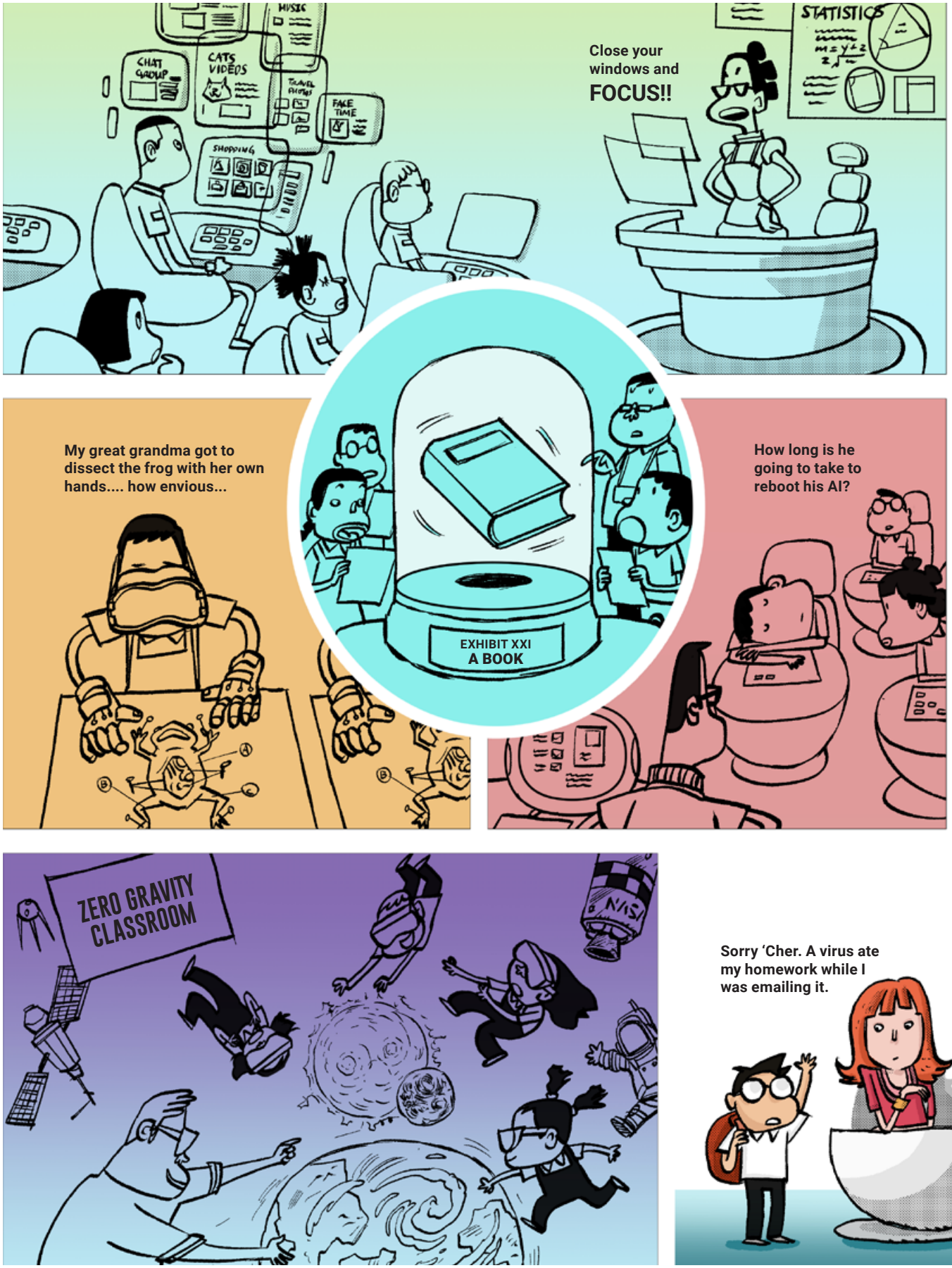
Take, for example, the concept of math trails. Teachers bring students on a walk around the school compound, in nearby parks, or in nature reserves, to learn about Mathematics and Mother Earth at the same time. Whether it's estimating the height of trees, or exploring the rate of deforestation, the idea is to make learning real and interconnected .

"Capture their interest first," says Mr Tan. "Get them to see the relevance of what you're teaching, see that learning can be interesting, and excite them to learn more. Only then can you talk about concepts that are more abstract.

"I'd design a math trail and show my teachers how it can be done. Then, we each adopt a park for our classes, and then share what we did. We'd teach each other new ways to experiment and use the parks for lessons. Till today, Deyi is still notable for math trails."

# Classroom of the Future

ARTWORK BY **DON LOW**



# ROBOTICS IS NOT ROCKET SCIENCE

An expert roboticist explains why this field of study is more relatable than you'd imagine.

**Dr Ayanna Howard**, roboticist at Georgia Tech Institute and former NASA engineer, lives and breathes robotics. Her resume includes designing and programming robots such as a Mars rover and spiderbots that trawl through Antarctic glaciers. At present, she heads Zyrobotics, a startup that aims to use AI and assistive robotics to help children with special needs. Some of us may construe robotics as rocket science, but often it is simply a tool to make our lives easier. Here, Dr Howard demystifies what robotics means to her.

## 01.

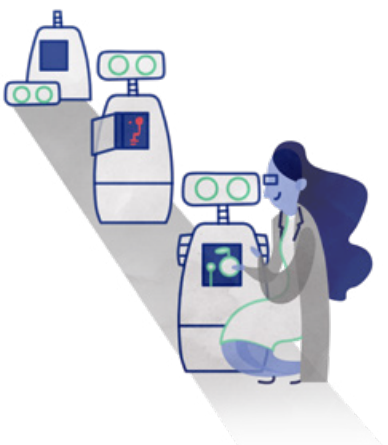
Robotics is about being able to think how to create something that doesn't exist. Creativity and innovation are part of the formula to become a roboticist, in addition to skills like math, science and coding.


## 02.

There's a thinking process of solving problems in robotics that I want students to have, such as "How do I design a solution to a problem?" or "What is the process of sequencing things together?" This process applies to everything in life, to law and medicine, and solving difficult problems where there is no solution.

## 03.

Like a science experiment, robotics is about trying something that you hope works. If it doesn't, you try again, and again.

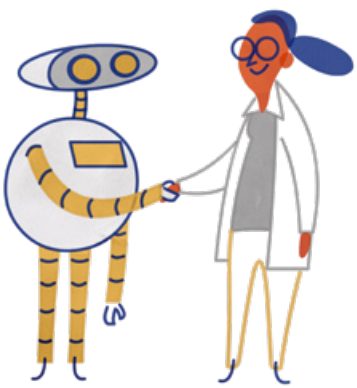


## 04.

AI are smart, but not super intelligent. It's us that give them the power to do things and so it becomes our responsibility to ensure we think about what we're doing and embrace robotics. Some robots are cute and friendly, they can enhance our quality of life. But we also have to think in terms of "What's next?"


## 05.

Robots should be designed to have social impact so that they really make a difference in this world. I think assistive technologies are one of the keys to ensuring our world is accessible to everyone.



# THE CHANGING FACE OF WORK

Technology is changing the very nature of work as we know it. Here are some of today's jobs that were unheard of just five years ago.

## TELEMEDICINE PHYSICIAN

With technology, the doctor is quite literally just a call away – all day, any day. Telemedicine physicians provide medical care via communication channels such as phone calls, video conferencing, or online chats, and usually attend to patients with health conditions that aren't considered emergencies. Such conditions include flu-like symptoms, minor injuries and rashes.

## AUTONOMOUS VEHICLE ENGINEER

If autonomous vehicles continue to grow in popularity, there's a good chance we'll never have to drive again. Till then, autonomous vehicle engineers have to keep improving the way these vehicles work: helping them "see" better, sense objects around them more accurately, follow traffic rules and navigate traffic – better than we humans do.

## VIRTUAL REALITY CONSULTANT

Virtual reality (VR) is one of the fastest growing fields in tech, and VR consultants – those who plan VR projects – are increasingly in demand. VR is essentially a way to explore new worlds, whether through virtual property tours to fully-immersive games set in a 3D environment. Don't confuse a VR consultant with a VR designer though: the main role of a VR consultant is to be the point person between the technical VR crew and clients.

## SUSTAINABILITY MANAGER

Raging bushfires. Rising sea levels. Extreme weather. Climate change is real – and sustainability is becoming a greater priority among global organisations. Sustainability managers play a crucial role in helping businesses meet their environmental goals by developing sustainability strategies and ensuring they are followed through with. Such strategies include introducing environmentally friendly changes such as the use of renewable energy, water conservation and near sourcing – that is, using vendors located close by.


## CHIEF LISTENING OFFICER

Who'd have thought just being a good listener would be enough to land a top job? Chief listening officers listen constantly – to both external and internal chatter, that is. This means keeping on top of the latest news, social media posts, forum conversations and more. Such communications will help the Chief listening officer develop plans to help a business or organisation improve the way it is run – whether in terms of marketing, customer engagement, or employee relations.


Keep a look out for details on MOE's social media platforms and website

**HTTPS://WWW.MOE.GOV.SG/OSOS**


# Today's lesson is about thinking outside the box!

ARTWORK BY **DON LOW**